# POPULAR AVIATION

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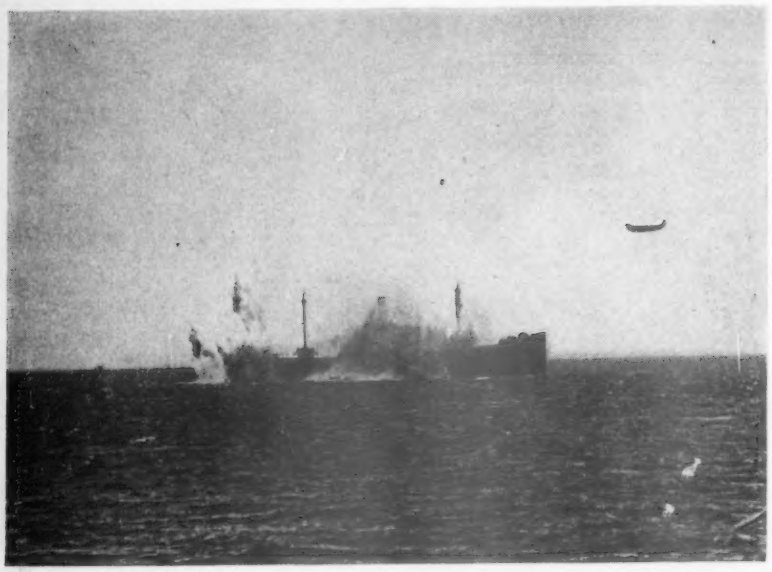
# Who *Really* Sank



**The bombing of the Mount Shasta, showing an explosion crippling the after portion of the ship. The ship was completely disabled.**

*by* GENERAL
WILLIAM MITCHELL

Formerly Director of Military Aeronautics, U. S. Army and Commander of the Overseas Air Service of the United States during the World War.

THE bombing of the steamship "Mt. Shasta" by the Army Air Corps in August, 1931, was heralded throughout the country as a great failure. The publicity branch of our Navy Department issued misleading and untrue propaganda as to what happened.

Silly letters were written from one of the Assistant Secretaries of the Navy to the Secretary of War so as to affect the public mind with doubt as to the power of aircraft over seacraft and to bolster up the propaganda for more battleships for the Navy.

Before reminding our readers of what we have done in the past, to prove conclusively and for all time that aircraft completely dominate seacraft and can sink them any place, at sea or in harbors or in clear weather or storms, we wish to present the actual facts concerning the sinking of the steamship "Mt. Shasta".

Since 1923, when the air forces under my command sank the battleships New Jersey and Virginia, there had been no bombing practice by air forces against seacraft. Consider the significance of this. The principal defense of our coasts, the only defense in the air, has been relegated to the background. The coast defense guns, which are able to shoot only a few miles from shore and cost $2,500 every time they are fired, are constantly practiced with.

Naval vessels costing up to $70,000,000 apiece, whose speed on the water is only 35 miles per hour and whose guns are far from accurate in their performance, are allowed to go out and millions of dollars of the nation's money are spent on their maneuvers. Both the coast defense guns and the naval vessels would be practically useless in war against a strong air power.

The theory of war, as accepted by the great nations today, may be stated thus: War is a continuation of national policy by physical means when all other efforts for its enforcement have failed. In order to impress the country's will on a hostile nation, it is necessary to paralyze his vital centers and make it impossible for the people to carry on their ordinary life.

*THIS is the second and last article in this series by General William Mitchell in which he disproves the statements of the Navy regarding the sinking of the steamer Mount Shasta and other naval craft.*

*General Mitchell's strong articles have shown how and why the Navy is prejudiced against the use of aircraft and how it has attempted to convey an incorrect impression of the bombing trials to the public by various methods of propaganda.*

Heretofore, armies have been assembled and have attempted to get to these vital centers over the land. This has proved a laborious, expensive and probably impossible process, on account of the development of modern firearms.

Navies are useful only in cutting off food supplies and other necessities that are imported. The more self-contained a country is, the less it needs a great navy. Surface navies now, entirely aside from the menace of air power, are at the mercy of submarines. The submarine is the principal naval weapon today.

The spear point of offense and defense is air power. It can go straight to vital centers, the cities and manufacturing areas. Lines of communications that carry supplies to millions can be destroyed and neutralized by air power. Nothing can combat air power except other air power and it is a serious question today, whether, with the vastness of the air in which aircraft can operate, they can be found and stopped at all.

ALL nations, except the United States, have organized their national defense into three branches, air, land and sea. Air power is to hit straight at the vitals of the enemy, sea power to work in the water and under the water well away from the shores, and man power armies to hold the land.

Their air forces are given the greatest latitude for development as is necessary with a new and expanding weapon. They are not tied to armies and navies which would act like millstones around their necks and thus prevent development.

In this country, unfortunately, under the present administration, our air power has been tied to the army and navy. The Navy, particularly, seeing that its political power, prestige and place in the national defense would be greatly affected by the development of air power, has prevented, through political means, the organization of an independent air service. President Hoover, himself, because he believes he can get more political power from the steel, oil and coal interests that feed the navy, and more support from the localities where navy yards are located, many of them entirely useless, has kept up this system.

It is the worst racket to which our country has ever been subjected. The lobbies of the Navy in Washington pass anything of the kind that has ever

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# the Mount Shasta

*THOUSANDS of pounds of bombs were rained upon various types of vessels during the bombing tests carried out by the Air Corps, with tremendous damage to the vessels in every case. There is no armor built that can resist an aerial bomb, hence the battleship is helpless against an attack of bombers.*

been there before. Their publicity extends to practically every journal in the country where many of their reserve officers are placed on the editorial staffs. If this were doing any good, it would be another matter. What it amounts to is a National Defense Trust and restraint of development which is draining our Treasury, misleading the people and preventing the development of air power.

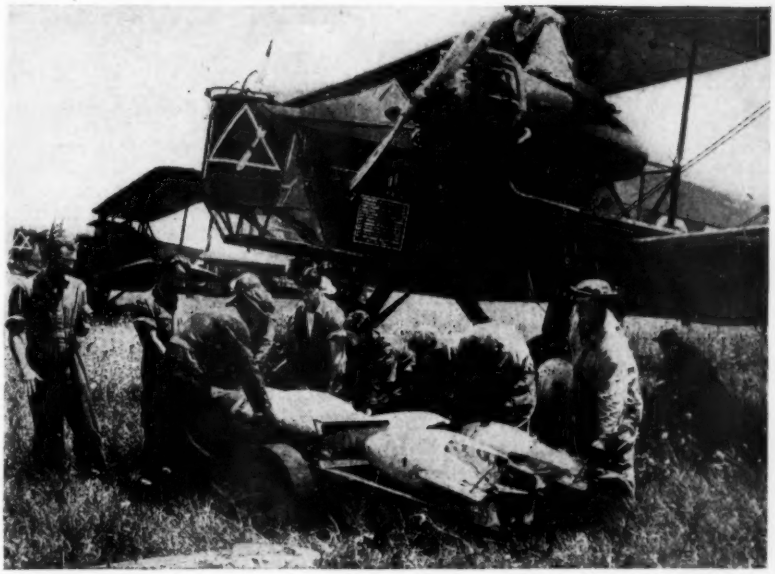
With these facts in mind, let us turn to the Mt. Shasta. The Army Air Corps had for a long time been attempting to get a vessel for use as a target and wanted to put it near Langley Field, Virginia.

The fishermen and oystermen in that vicinity protested that it might injure their business by killing fish, hurting oysters and interfering with their work in the water. They asked that the bombing be done elsewhere. This request was granted and it was decided to place the Mt. Shasta at a distance of about 60 miles off Cape Henry where the water is nearly 100 fathoms deep.

The Army Air Corps began a great campaign of publicity, telling how quickly the vessel was going to be sunk and so on. They did not realize that their bombers were not equipped nor trained in the way they should have been for sinking ships. The men whom I had with me some years ago who were experts at sinking vessels, used to war and entirely conversant with their business, had given place to others with no training in such maneuvers and only a rudimentary knowledge of what it was all about.

THE Mt. Shasta, a ship of 7,000 tons, entirely light, with no cargo on board and no steam in her boilers, was towed out to the appointed place. A vessel of this kind, while easy to put out of commission with projectiles, is hard to sink with bombs because it floats on top of the water like a cork or soap bubble. Its sides are quite elastic so that underwater explosions do not affect it very greatly.

Ordinarily, the underwater effect of great airplane bombs is tremendous.



**Loading the bombs on the bombing planes for the "attack" on the Mount Shasta. These were only 300 pound bombs, insufficient for the purpose.**

If a 4,000-pound bomb is exploded ninety feet under the water, within two or three hundred feet of a battleship, it will open up all the seams in her bottom, bend her propellers and rudders and destroy her condenser pipes. It will probably loosen all her engines and topple them over, sinking the ship in a short time.

If such a bomb were exploded immediately under the ship, it would probably lift the vessel completely out of the water. A single hit on deck of a modern battleship by a bomb of this size would tear the superstructure to pieces and probably kill all the personnel on board from the effect of the detonation.

*WE HAVE published this authentic article with the hope that General Mitchell's revelations will awaken the American citizen to the fact that all is not well within our national system of defense.*

*General Mitchell knows, and Walter W. Liggett knows how petty politics and personal greed can disrupt our air forces—the most important armament that we have today.*

As the Mt. Shasta, on account of her lightness, would not be so greatly affected by underwater explosions, hits should have been made close to her with very large projectiles, or else direct hits made on her so as to blow her to pieces if it were desired to sink her. Of course, comparatively small projectiles would put her out of business.

The whole force of army bombers, consisting of about fifteen, prepared to attack. They were obsolete types, poorly equipped and carried only 100-pound and 300-pound bombs, where they should have had 1100 and 2000-pounders for a mission of this kind. On the day appointed for the target practice, a heavy northeast storm came up. I had started down Chesapeake Bay in my yacht to see the exercises but, on account of trouble with an engine, had to put in at the mouth of the Patuxent River for repairs, which was fortunate for me as a very heavy sea was running outside the Capes. The clouds were low, giving a ceiling of only about 400 feet, and in many places the visibility was so bad that it was difficult to see objects at any distance.

An airship and some airplanes for observation purposes were sent out to the Mt. Shasta. They found their way without any trouble and remained over the hulk, waiting for the bombers. The fifteen bombing ships, flying in one formation, crossed over Cape Henry to the Currituck Lighthouse and then proceeded toward the Mt. Shasta. The leading pilot, who had not had much experience, allowed too much for the northeast wind and led the flight to the north of the target.

As the ship was passed, the only old pilot and expert bomber in the formation saw it and reported it to his flight commander. But he was told to keep quiet, because two major-generals who were in the formation were talking to

each other about something entirely irrelevant to the bombing. These two officers, of the usual "air-fakir" type, had insisted on going with the formation, thus disorganizing the whole thing, instead of going in an observation airplane and watching what happened.

THE experienced pilot's report was unheeded. When the formation did not sight the Mt. Shasta, it was decided they were south of it, so they proceeded twenty miles to the north getting farther from it all the time. Instead of zigzagging on forty or fifty mile reaches, they merely turned around and returned to their starting point and not seeing the Mt. Shasta, went back to the field. The airplanes that were already over the Mt. Shasta stayed there until their gas began to get low, then they too went home. Thus ended the first day's much heralded exercises against the Mt. Shasta.

With a well-organized and well-directed air force, the ship would have been attacked by converging columns of aircraft, coming from different directions, communicating with each other and guided by radio, even though the enemy tried to jam it.

On this day the seas were so high and the weather conditions were so bad that a surface ship would have had great difficulty in hitting anything with its guns, in launching its planes or even in finding its way around. An army vessel, the "Scofield," was out there observing the tests, and practically all the officers on board became seasick. One of its boilers blew up and it had to be towed to shore.

Gen. Wm. Mitchell, author of this article, is a practical pilot, and is shown here in his flying togs.

Of course, the airplanes that were over the Mt. Shasta could perfectly well have dropped bombs on it and sunk it, but as the main column of bombers did not get there, the publicity department of the Navy flooded the country with reports of how the whole thing was a fiasco.

Two days elapsed before the attack was continued. This time the bombers quickly picked up the target and attacked it, but on account of their lack of practice, they did not know the best formation, nor manner of attacking. Their largest bombs, 300-pounders, were quite defective. Either the fuses did not act at all, or, instead of having a delayed action which would have allowed them to pierce well within the vitals of the ship before bursting, they exploded immediately on contact.

Even under these conditions the Mt. Shasta was pierced by over 2,000 holes, with one crack about four feet deep and over seventy feet long, all the way down her port side. Her engines were disabled and twisted and when the bombers left her, she was in a sinking condition and would have disappeared from view in ten or twelve hours. The Coast Guard sent officers aboard who made a minute inspection and reported these facts. They then fired a few small projectiles into her sides to hasten her sinking.

The Navy Department published far and wide that the bombing had no appreciable effect on her and that the Coast Guard had to sink her with one-pounder cannon. This is absolutely untrue and was published with intent to deceive the American public. Now we have the spectacle of our air force, on which our country must rely for defense, equipped with unsuitable airplanes, defective ammunition and untrained crews.

LET us not forget what we have proved about aircraft and its supreme power. The Hoover regime and the bureaucrats in Washington have dealt our national defense a terrible blow. They have stopped the development of our air power. They have covered this up by their paid propaganda to delude the American people. It is fooling nobody in the world except ourselves. The whole world now is in a chaotic economic state which always brings on war. The history of the human race shows that when a person or nation is hungry, treaties, agreements, conventions and and covenants have little effect.

We need a good army and a good navy, but above all we need a good air force, untrammeled by the politicians both in the armed services and out of them. Aircraft can sink sea-craft anywhere. The men who fought in the air services, who proved this before, can prove it again if that is necessary.

END.

## Something New In Rockets Propellents

Wooden model of the Poirier Gas and powder rocket.

THIS is a model of a new inter-stellar rocket devised by Maurice Poirier, Glendale, Calif., who has made two previous attempts at sending a rocket to the moon. He formerly employed a mixture of gas and powder.

The present rocket is to be propelled by gas made from a German wood. Poirier claims that these experiments are preliminaries to the construction of a rocket airplane that will be capable of traversing the American continent in five and one-half hours.

## A Lucky Break for the Junkers

THE airworthiness of the newest of the Junkers air transports, Ju-52, was strikingly demonstrated.

The big craft, piloted by the German airman, Willy Polte, was making about 160 miles an hour when suddenly the left outboard engine was torn nearly away and the left undercarriage seriously damaged. A landing was effected in a wheat field and only then was the cause of the accident discovered.

A student pilot in a little Flamingo, intent on a landing, had crashed into the transport from below. Parts of this plane were found hanging to the liner. Fortunately, the student had escaped unhurt in a parachute.

The Ju-52 was the first plane to embody the new "double wing" or adjustable wing flap designed by Dr. Junkers, and to this device, which enabled Polte to cut down his landing speed materially, and to the all-metal cabin which remained intact, was attributed the fact that there were no injuries.

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# How War Medals Were Earned

*by* CARL B. OGILVIE

**A review of actual incidents which served as a basis for later citations.**

THREE American pilots, in trim speedy Spads, had been patroling the lines above the St. Mihiel sector for nearly two hours. The flight leader waggled his wings and banked. The "V" formation, with its gas supply running low, turned and nosed westward into the blinding rays of the late afternoon sun.

The trio's patrol was over. And it had been a singularly quiet and uneventful tour. Disturbingly uneventful. The squadron had been informed that a large formation of Fokkers, protecting two photographing planes, had crossed the lines to the north. Orders were to keep the enemy from taking pictures over the sector where heavy troops concentration was under way. But no enemy ships had been spotted. The tour had been just a part of the daily grind.

Uneventful—yes. But the patrol had some miles before reaching its 'drome. If the pilots behind those spinning props felt secure, it was a false sense of security. If they reflected on the pleasantries of the coming evening at the *estaminet* in the village nearby—they were over-confident. For the uneventful can, in the air and especially in war time, become in the twinkling of an eye the most eventful, hazardous and outstanding moment in a pursuit pilot's life.

Then, as if from nowhere, the trim dark bodies of a dozen Fokkers came hurtling down upon the three Yankee Spads. The sky became a furious whirlwind of planes whose wings flashed in the sunlight and whose machine guns spat tongues of flames.

Both formations broke up. A wild fast-paced dog-fight took place. It was every man for himself.

The Germans' strategy was to single out the Yanks. Groups of four went diving on the Yankee patrol leader and his two buddies.

The Yank leader dressed his ship and sent a spray of tracers raking the sky for the nearest German.

A Fokker streaked out of the fray—a swaying ball of flames suspended by a long pendulum of black smoke.

Pilot No. 2 found himself surrounded and isolated from his buddies. His Vickers flashed at the attacking Germans. In quick order he sent one down out of control. Looking down a thousand feet below he saw his leader in a tight jam. Immediately he nosed down.

THE third American pilot's guns jammed. He didn't have a chance to fight back. He would be cold meat if he wasn't a mighty skillful pilot. He zoomed, whipped out of a stall and went down. Then suddenly he saw what was taking place below. He pulled out of the dive and by skillful maneuvers, feinting, bluffing as he raced at one, then another, he succeeded in keeping the Germans from diving down on the other Yanks.

**A sketch of the most coveted of all military rewards—the Distinguished Service Cross.**

The fight leader succeeded in getting his second German.

The enemy pilots became weary. Already three of their best pilots had gone down to defeat. Discretion is the better part of valor. They pulled off and the three Yanks chased them back across the lines.

Then, suddenly remembering their gas supply was nearly exhausted, the Yanks turned back for home. Turning on the reserve supply, they barely made their airdrome before the greedy Hissos drained the tanks dry. Mechanics hurried out to the field to trundle the Spads to their hangars.

The sergeant-mechanic of the flight leader's plane eyed critically his officer's tattered, battle-torn plane, but he said nothing. He knew, without asking, how close death had missed the three pilots of the squadron.

In the operations office, reports were made out and confirmations requested for the leader and pilot No. 2. Also the third pilot was warmly praised for his gallantry and devotion to duty for keeping off—despite his jammed guns—some of the enemy planes. Within a short time, French and American balloon observers phoned in confirmations which they had put in writing and forwarded to Headquarters.

In a few hazardous minutes three American pilots had become famous along the Front. Three victories in one flight.

SOMETIME later, the three pilots and the flight leader's mechanic stood in a line at rigid attention as the rest of the squadron was drawn up in a three-sided square with the planes forming the fourth side. An adjutant read the citations and orders. A Brass Hat stepped forward and pinned something on the left breast of the tunic of each man.

Later, at a Discharge Depot, we see the same four men again—standing at attention for the final inspection before being honorably discharged and mustered out of service.

On the left breast of the tunic of each are bars of colored ribbons. Conspicuously bright and new, they are different both in color and decorations. Yet the pilots served in the same squadron and fought in the air together.

A Brass Hat passes by, inspecting his command. Above the silver spread wings on his tunic is a single silver star probably five-sixteenths of an inch in diameter. None of the pilots he is inspecting have a similar decoration above their wings. There is a reason for this.

During the war there were two air ratings—Military Aviator and Junior Military Aviator. The law at that time permitted only 25 ratings as military pilots. Among those who held this exclusive rating during the war were:

Major General B. D. Foulois, now Chief of Staff of the Air Corps.
Brig. General F. P. Lahm.
Colonel Roy S. Kirtland.
Lt. Col. H. H. Arnold.
Major L. H. Brereton.
Major H. A. Dargue.
Major R. G. Landis.

NOW, one of the pilots, the No. 2 man of that late afternoon patrol over the lines, wears a dark blue ribbon with the ends piped with narrow bands of red and white. The patrol leader has the same colored ribbon but on it is a bronze oak leaf cluster. The No. 3 pilot has a single rainbow Campaign ribbon with a silver star at its center. The mechanic, who took care of the flight leader's ship, also has a

rainbow colored ribbon, but on it are several bronze stars.

Do you know what the different colored ribbons and their decorations represent? Test yourself. See if you remember or can guess.

The dark blue ribbon—piped with red and white? That's an easy one. It tells you that the wearer was awarded the Distinguished Service Cross. The bar is made of the same kind of ribbon from which his D. S. C. was suspended when it was presented to him in France. Now you know that when he went down to help his leader he winged his way into the "medal man" class.

His flight leader's ribbon is embellished with a bronze oak leaf cluster. You know what the cluster represents. Sure—an additional bestowal of the D. S. C. The bar of ribbon itself signifies that he had once before won the D. S. C. When he downed two of those twelve Fokkers he was again given the D. S. C., that is, he got the cluster for the second award in lieu of another Cross.

And here's something very singular about the D. S. C., which if you don't know, I think it's well to remember: The Cross, by law, cannot be awarded for any act which occurred more than three years before the date of the award—with two exceptions:

1st. When a Medal of Honor has been recommended but disapproved.

2nd. When the individual is cited "in orders" for heroism in action.

So when you hear of the Cross being awarded to someone recently for bravery in action during the World War, remember this—that such cases come under the first or second exceptions and are settled on their merits without regard for elapsed time.

A little over 5,200 Distinguished Service Crosses were awarded for service in the World War, and 10 oak leaf clusters were also given. The Infantry got, by far, the biggest share of bronze D. S. C.'s. But it took the Air Service to make a raid on the clusters, carrying off exactly half of those awarded.

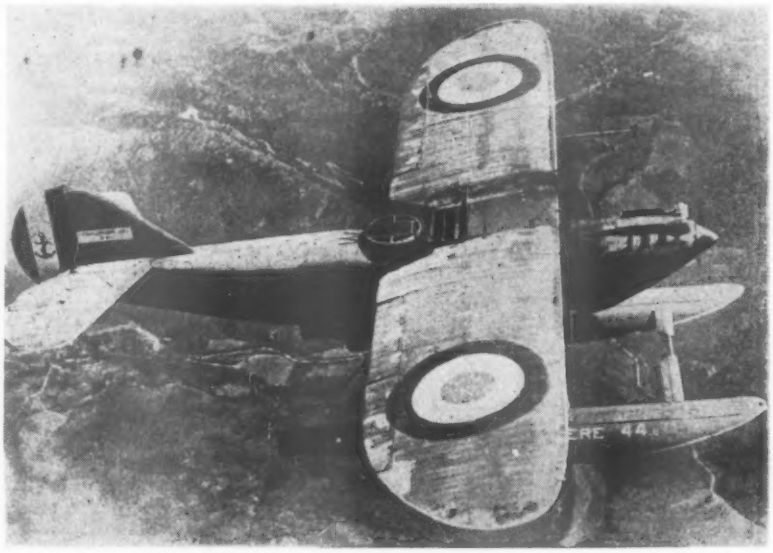
An analysis of the clusters shows a great divergence from that of the Crosses—particularly in regard to distribution between different arms of the service. I give you here the total number of oak leaf clusters won by different branches as I copied them in the War Department in Washington, D. C.:

| | |
|---|---|
| Air Service | 58 |
| Infantry (includ. Marines) | 35 |
| Tank Corps | 5 |
| Medical Corps | 2 |
| Field Artillery | 2 |
| Signal Corps | 2 |
| Brig. General | 1 |
| Chaplain | 1 |

Of our 41 air heroes who won those 58 bronze oak leaf clusters, 7 of them

(*Continued on page* 53)

## A French Torpedo and Bombing Plane



A view of the French torpedo and bombing plane in flight, in this case, provided with pontoons although landing gear may also be employed.

THIS new bombing and torpedo plane, devised for the French army air forces, is so arranged that its landing gear can be quickly exchanged for the pontoons shown in the photo.

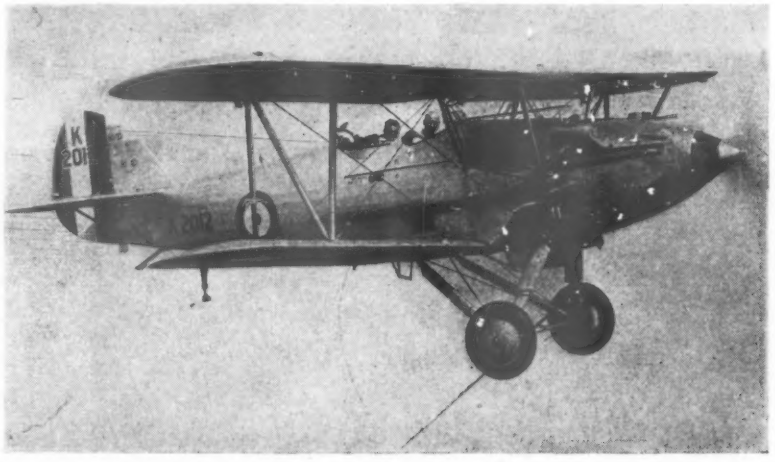
When used as a torpedo plane, this ship carries a torpedo weighing 1,430 pounds which is released at a height of from 50 to 70 feet above the water. The pilot and torpedo operator are protected against machine gun fire by a new material, but the windows are so arranged that they have an excellent range of visibility in all directions.

## The Hawker "Audax" Two-Seater Shows Ability

HERE we see the British military two-seater, the Hawker "Audax" in flight. Two squadrons of these ships have been completed according to our latest advice, and are to be employed for army cooperation.

Hanging below the landing gear is the message pickup by which messages can be picked off the ground without the necessity of landing. However effective this device may be, it is certain to call for a considerable maneuvering ability on the part of the pilot nevertheless.

This is a typical British layout with the pointed nose fuselage and the biplane arrangement. Wing slots are provided along the leading edge.



The British "Audax" in flight with the message pick-up shown hanging down from the landing gear. This plane is equipped with a water-cooled engine.

# Old Bill—The Jenny Jerker

*by* WILLIAM L. HOPSON

The true story of an old roughneck barnstormer.

TO THE boys who knew him he was Old Bill. Not so old, either. Only forty. Face like brown saddle leather, eyes that wrinkled at the corners from long exposure to the biting blast from a propeller, hair a little thin on top—but a *pilot!*

Sixteen hundred hours in Jennies, "Tommies," Standards, Canucks; sixteen hundred hours behind Hissos, OX's, LeRhones and Hall-Scotts, before he ever climbed into the cockpit of a new-production job. That was Old Bill.

He probably never heard of the words, "Alto-Stratus". Had you mentioned "Angle of Incidence" to him he would have thought you were talking Greek. But he knew almost to the foot how much field it would take to get a loaded Jenny off. And he could do things in the air with that same Jenny that plenty of the later pilots couldn't do with a new, higher powered, job. Again I say, "He was a pilot!"

* * *

I WILL never forget my first spin. Most men don't. Three thousand feet up. A gentle closing of the throttle. Back on the stick a trifle; then she began to mush, quivered a moment and the left wing went down. My first spin! A turn and a half, stick in neutral and left rudder.

She didn't come out! Two turns. . . . Three . . . four! Screaming wires . . . She only spun faster. A sickening sensation, a slight giddiness. Then old Bill turned around in the front cockpit.

"Dammit!" he roared, "Giv'er her RIGHT rudder for a left spin! Now bring her out of it." I did.

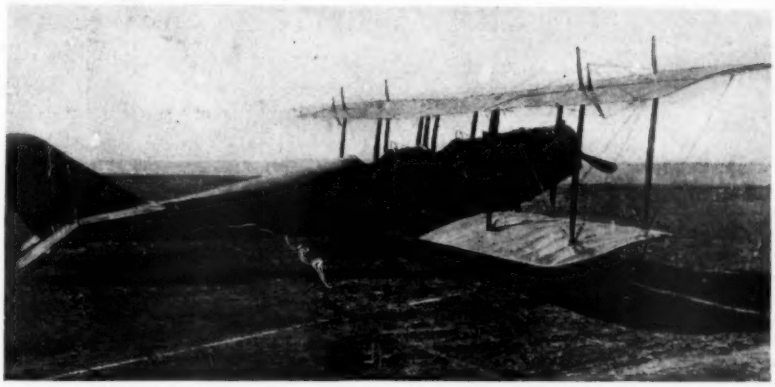
* * *

CHRISTMAS EVE in a little town in the middle West. The one wide street of the town was crowded with eager, bright-faced children looking up —always up.

Old Santa Claus was soon coming, coming by airplane to descend into the streets by parachute to be with them once more. The children waited and watched impatiently.

Suddenly there came the faint hum of an airplane motor that gradually developed into a roar as an airplane, flying low, flashed into view. There was a cry of childish delight from three hundred young throats, a waving of mittened hands in the cold air. Around and around the plane circled, barely clearing the tops of the buildings while a figure in red waved from the front cockpit to those below.

Then the water in the radiator froze, the spinning propeller slowed, stopped. The plane barely cleared the top of a two-story building before it came to a landing in a cleared space nearby with the crunch of a splintered landing gear. Breaking away from anxious parents, the children started toward the plane in a mad dash to greet old Santa. Men and screaming women also ran.



An old "Jenny" trainer of the type used after the war by "Old Bill" and flyers of his type. "The most swore at and swore by," plane ever produced.

Eagerly the children made for the bedraggled figure in red walking with the pilot disgustedly around the plane.

But was it Santa Claus? The children suddenly began to harbour grave doubts. Some of them stopped and pondered. The figure looked like Santa —yes; and yet, it didn't! For who ever heard of a Santa Claus that carried his whiskers around in his hand? And such language! It fairly blistered the air. Strange, but Santa Claus had never used such words before. No, the children decided, this wasn't Santa Claus. There was no such a thing—for this was only old Bill.

* * *

IDAHO. 1923. One afternoon out in a large field, a farmer leaned on his shovel and watched the clear cold water that bubbled up from a pipe underground and spread itself over the check of alfalfa he was irrigating. No sound other than that of the gurgling water broke the stillness of the afternoon. Life was monotonous.

Suddenly he cocked his head to one side and listened. Low and far away came a faint humming sound that quickly grew in volume. Then he located the source of the noise.

"Dog-gone!" he ejaculated. "One of them flyin' machines! Heard one was in town takin' people for rides. Wisht he'd come over a little closer so's I could git a real close look. Fust one I ever seen."

He stood and watched, ogle-eyed, as it winged swiftly nearer. Then it banked around in a wide circle, the song of the motor ceased, and it began to lose altitude.

"Must be in trouble an' lookin' for a place to come down," ruminated the honest tiller of the soil. And a moment later:

"Dog-gone! He's comin' over this way. Mebbe I'll get a close look—what 'n he---!"

The words burst from him in startled surprise as the motor suddenly picked up and the plane headed in a dive straight for what the farmer thought was the top of his head. He dove for the ground.

"Yuh . . . smart aleck!" he roared, regaining his feet and shaking an indignant fist. "Whadda yuh tryin' to do, kill somebody? You'da hit me . . ."

He dove for Mother Earth a second time, leaving the words unfinished.

Not far on his left ran a shallow irrigation ditch — to him Providence sent. With remarkable agility for one with no practice and handicapped by the weight of rubber hip boots, he sprinted for it and safety. He reached it, slid over the edge, and standing knee deep in water waved his hat derisively at the grinning pilot and his passengers. With a return wave of the hand old Bill turned the ship back toward town.

* * *

ONE summer night in San Antonio, a man sat in the doorway of his house playing with a pet monkey. Past the door ran the sidewalk of a broad, well lighted street. The man went on to play with his pet then looked up at two figures coming down the street.

Dressed in khaki shirts, whipcords and and leather boots they were, and as they weaved arm-in-arm along first one side of the walk and then the other, they sang snatches of popular songs—and

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now and then stopped a moment to argue spiritedly.

They reached a spot near the man, saw the monkey and stopped.

"Let's buy him f'r a m-mashcot," suggested the older of the two.

"S'a good idea," agreed the other. They did.

Twenty miles south of San Antonio on the following morning, the motor on the Jenny suddenly sputtered and cut out. The man with the monkey on his lap in the front cockpit looked over the side and grunted.

In the back cockpit, old Bill cut the switch and began to swing the ship in slow, easy, skillful circles toward a small field almost directly below. Moments later he side-slipped down over a line of telephone wires at one end of the field and set the Jenny down to a bump landing. Five minutes later the motor was again turning the propeller as before.

"The field's pretty small for a take off," said Bill, "but I think I can take her out alone. Watch where I go and come over when you see me set down again. Better put the monk in the front cockpit so you won't have to carry him so far." He climbed back into the rear cockpit.

The Jenny strained against the rocks blocking her wheels as the pilot opened the throttle wide and held it there. He then kicked full right and left rudder. First one wheel and then the other climbed over. The Jenny was away.

Three-fourths of the way down the field the ship left the ground. Up, up, it climbed—then it smashed into the telephone wires that ran across that end of the field. Moments it hung there, tottered and dropped back to earth with a crash.

The first sound that assailed the ears of the slightly dazed pilot was a series of squeaks, shrill and protesting. He opened his eyes to see a very frightened little monkey running excitedly up and down what was left of the upper wing. The pilot climbed slowly from the smashed cockpit and gloomily surveyed the wreck as his partner came panting to the scene.

"And to think," mourned Bill, "that we paid twenty bucks for you as something to bring us good luck! Don't look at me that away, you peanut-eatin' louse factory. A helluva lot you got to squawk about!"

That afternoon the little monkey was returned to his former owner with Bill's profane compliments.

* * *

ARIZONA. 1928. One February day at noon I swung the prop on the OX5 new-production job that old Bll had so proudly been flying for the past few weeks. He sat in the front cockpit, and while waiting for the idling motor to warm up, turned to the student seated in the rear cockpit.

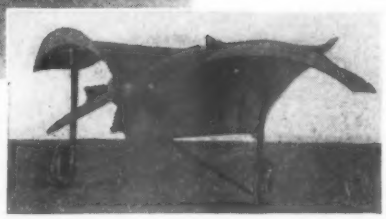
"I want to check you out in figure eights, verticals and a couple of loops

(*Continued on page* 52)

## A New Design for a Direct Lift Machine

AT LEFT. A side elevation of the Clawson tunnel type airplane, showing how the air is directed through the peculiar wings for obtaining direct lifting effect.

BELOW. A front elevation of the new ship showing the arched form of the wings, or "wing gutters." The downward reaction of the air raises the ship.



A NEW type of airplane, differing radically from any now in use, has been invented and patented by Lewis F. Clawson of La Mesa, California.

The plane is simple and compact in design with wings of veneer or thin metal spaced along the sides of the fuselage and slotted to increase the lift as the airstream, deflected by the V-shaped body, passes under and through them.

The machine is said to be capable of taking-off and landing in confined spaces as the propeller slip-stream enables it to hover under complete control, which is unusual.

Speed is not sacrificed as the frontal area is small and parasite resistance at a minimum. Stalling or spinning according to the inventor is virtually impossible and speaks for safety.

The small hangar space required, the fewness of parts and the low cost of construction make this plane eminently suitable for private use.

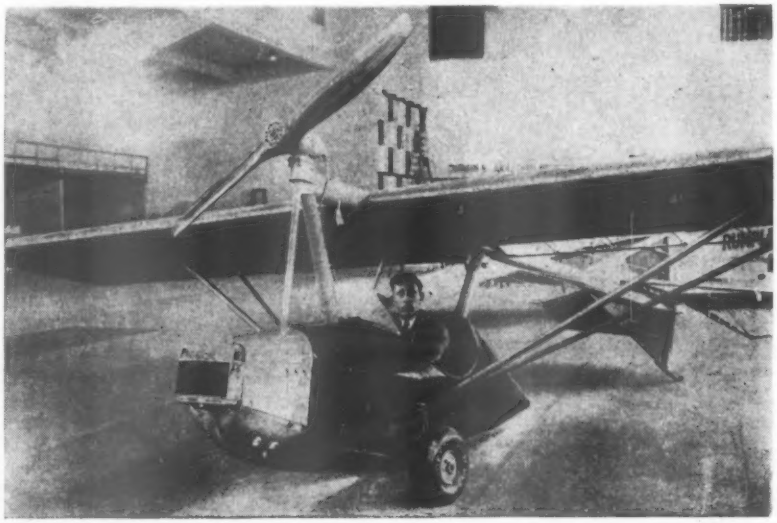
## A New German Lightplane Arouses Interest

HERE we have a peculiar lightplane of German design which seems to be a cross between a powered glider and a parasol type plane.

It is a monoplane of the tractor type with the short body or "nacelle" hung well below the wing, while the tail assembly is carried at the rear by a simple tubular boom, thus eliminating the drag of a trussed system at the rear of the wings and of the body.

The engine is a 23 h. p. water-cooled type carried in the nose of the nacelle, and drives the propeller through gears by a vertical shaft. It is said to be quite speedy and easy to handle.

The landing gear has been brought down to an unusual degree of simplicity for the wheels are mounted close to the body without external struts.



Here we have the new new German "poorman's airplane." Note the radiator in the nose of the nacelle and the geared propeller.

# Aviation's Strangest Phenomenon

*by* NORMAN V. DAVIDSON

**There is a strange blanket-like barrier of air in California known as the "Lid" which confronts and bumps flyers attempting to break through it.**

TWO special trips each day to altitudes above 10,000 feet is the regular schedule for a little tin box kept at the Navy Air Station, North Island, San Diego.

This little tin box is used to get the "lowdown" on a peculiar weather formation known in pilot's language as a "Lid". The Weather Bureau calls it more technically an "Inversion". It is a phenomenon peculiar to the Pacific coast and occurs during the summer months between May and October with rather surprising regularity. It rarely occurs in winter.

Observance of the "lid" has been made as far north as Oregon and well down the coast of Mexico. It has peculiar, though entirely different effects upon the three types of aircraft: gliders, airplanes, and airships. Just what causes the phenomenon is not thoroughly understood and that is why the tin box takes its daily airings.

Before the box is allowed to make either of its two daily flights, it is put through severe physical tests to be sure that it will bring down the correct data. The aerographer first places the tin box in a special compartment that resembles a refrigerator chamber. A wet rag is placed over a small fan inside the compartment and the fan turned on to full speed.

Through the six thicknesses of glass in the door, the aerographer watches the performance of one of the recording hands on the tin box. If it meets the test satisfactorily the wet rag is removed. The tin box is then accurately tested for the temperature effect on a second recording hand by using dry ice first to secure an extreme low chamber temperature and then a high power electric bulb to get the extreme heat effect. If the tin box passes these two tests it is removed from the chamber and placed under a bell jar. Here the air is removed from the jar by degrees and the registering of the tin box is carefully checked against a mercury barometer in the office.

**Here the pilot is mounting the instrument case on a Navy plane ready for another test flight to the upper regions. Wait until he bumps against the strange "lid".**

When the tin box passes through these three severe tests it is ready to collect data on the "lid". It is taken to the field and trussed up between the struts of a powerful navy plane with "bungee" cord so that it not be affected by the vibration and bumps or the hot exhaust gases that it might encounter near the cockpit.

The flights are made with the greatest care and the ascent is slow with a climbing rate not exceeding 300 feet per minute. The plane is maneuvered to keep the instrument in the shade of the wing as much as possible so that the direct sunlight will not affect the sensitive recordings. The warmth of the hand will easily show on the record. Each flight requires roughly 40 minutes for the climb to 10,000 feet.

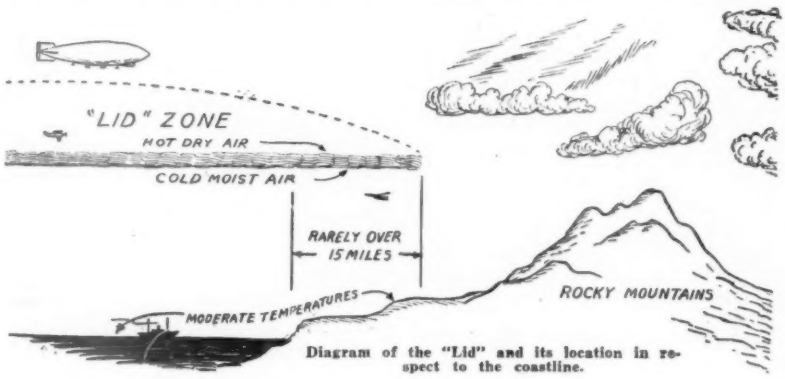



**Diagram of the "Lid" and its location in respect to the coastline.**

FROM the great care given the little tin box you might expect to find a complicated arrangement of instruments inside the box. If you ask the aerographer how complicated the instruments are he would probably smile when he explained.

"The instruments are made with precision to insure the highest degree of accuracy, but the vital parts are as simple as A B C. There is what amounts to a wrinkled tin can, a bent piece of metal and a dozen human hairs. Those three things give us an accurate record of just where and how tight the lid is."

The tin box as a whole is known as an aerograph or a meteograph. The wrinkled tin can is a sensitive recording altimeter. The bent piece of metal is a bimetalic thermograph or recording thermometer. The altimeter, sensitive as it is, seldom records the exact altitude for changes must be added or subtracted from its readings that are caused by the effect of the temperature on the air. As the temperature plays a striking part in the lid phenomenon, the altitude as recorded will often be considerably off.

The human hair is used to secure a continuous record of the change in moisture content of the air as the plane goes up. A woman's hair that has been curled on a curling iron will lose its curl on a damp day because it stretches, and this is the reason the human hair is employed in the moisture recording apparatus. The hair grows longer when it encounters moist air and shrinks in dry air. It is the

best known substance for this purpose and is surprisingly accurate.

Following carefully the recordings of the aerograph, it is found that from the earth upwards, the temperature steadily becomes colder to a point just below the "high fog" peculiar to the Pacific coast. Also the moisture increases until this point is reached. In the pilot's terms, the temperature drops and the moisture increases until we reach this ceiling.

The temperature on the ground may have been about 68 or 70 degrees. Up at the ceiling it is reduced until it is between 52 and 53 degrees. Immediately above the high fog is the lid, or sudden change to a very hot dry air. The temperature may jump from 53 to 85 or 90 degrees. The higher the jump, the tighter the lid. As high as 96 degrees has been recorded for a lid condition, and this is very rare for a temperature this high above the ground. People on the ground might be unaware of the fact that a hot lid was sizzling over their heads.

The lid often extends for a hundred miles at sea yet rarely goes inland over fifteen miles. It is thought from pilots' observations and experiences that it is wedged shaped with the sharp edge inland. Just what causes the lid is a mystery at present.

It was at first thought that the cool moisture-laden air was blowing in from the ocean at low altitudes, that hot dry air was blowing westward from the desert regions east of the Rockies at the high altitudes and that the high fog and lid were caused by this action. Sounding ballons, however, exploded this otherwise sound theory as it was found that all the air was moving from the west and inland!

THE lid perhaps derives its name from the way it affects the three forms of aircraft. An airplane is the least affected.

Imagine traveling between 100 and 125 miles per hour through a wet wintery atmosphere, then within a minute climbing into the hot dry air of a desert and you will have some idea of what the pilot experiences going up through the lid. The lid actually acts as a lid for a soaring glider as it is impossible to go up through the lid with this form of aircraft.

An airship, on the other hand, experiences the greatest difficulty in coming down through the lid from above. The airship, attempting to come down through a "lid", will literally bounce on the layer of heated air due to the fact that it suddenly heats the lifting gas and considerably increases the airship's lifting power.

If the lid is at all tight, some lifting gas will necessarily have to be released in order to get through. Once through, the cold air below the lid contracts the lifting gas and decreases the lift. This will cause the ship to drop until ballast is disposed of to counteract this effect.

## Here's the Average Army Air Corps "Kaydet"

*by* T-2003

Second Lieutenant Stunkard, a representative of the average Air Corps Cadet.

THEY come from all over and from all walks of life, these Army Air Corps "Kay-Dets," both the real Flying Cadets appointed from the ranks or from civil life and the student-officer-pilots who are recent graduates of West Point and who'd rather ride an airplane than a horse or fly than walk for their next thirty years in the Army.

When the Flight Surgeons at the Primary Flying School, Randolph Field, Texas, and the Advanced School at Kelly Field, Texas, total up all the measurements and other scientific calculations they've made on their ambitious subjects, and divide these totals by the number of lads examined, they find that the average fledgeling pilot of the Army is something like this:

Age—24 years.
Height—69¼ inches.
Weight—155 pounds.
Pulse rate—71.
Blood pressure—116.
Depth perception—12.

Not that a lad with a different weight or pulse rate won't make just as good a peelot for Uncle Sam, but the above is a sort of composite photograph of the average man among the lads who kinda like to fly and shoot guns and drop bombs instead of packing around a ton of letters with 8-cent stamps on 'em or hauling passengers over mountain and prairie.

Three lads nearest to the average in physique and age were picked from the class graduating October 14, from Kelly Field. Here's the dope on them.

Second Lieutenant Robert A. Stunkard is from New York City, entered West Point from the New York National Guard and graduated last year. He was made a big-gun man with the Coast Artillery but chose to first see if he could make the grade in the Air Corps. He specialized as an observation pilot at Kelly Field. When he leaves Kelly he'll be commissioned permanently in the Air Corps.

From the flying cadets, the average-man is represented by two "Bills"—Flying Cadets William L. Bogen and William J. Sindo. The former is from Glendale, California, and a graduate of the Occidental College in Los Angeles. The latter was born in Laquin, Pennsylvania, went through Alabama Polytech and made his home in Plaquemine, Louisiana. Some traveler. Bogen, the tallest, likes to hedge-hop as he chose attack aviation for his specialty. Sindo, who's been around, wants to see what more of the country looks like, so he chose to be an observation pilot. They'll be "looies" too, when they graduate and will be sent to an active squadron for duty.

Thus, we see that the average cadet is represented by a very high-class young man, both mentally and physically, and who has generally had some previous military training. If this is only the average, then what a superman the highest type must be!

Military flying demands the best that lies within a good man, and Uncle Sam therefore carefully chooses the material for this branch of the service. The Army Air Corps is much more exacting in respect to physical makeup than any civilian airline could possibly be, and that is one reason why ex-army pilots and cadets always stand a good show for the airmail and passenger carrying jobs.

Flying Cadets William A. Bogen (left) and William J. Sindo. They are wearing the new uniforms recently designed for the air cadets.

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# The Royal Mounted Aerial Police

*by* JAMES MONTAGNES

**And now we have an added interest to the romantic Canadian "mounties" who always get their man. The mounted police of Canada have acquired an air service which has been of great assistance in patrolling that vast country.**

AIRPLANES are being mentioned with greater frequency in the annual reports of the Royal Canadian Mounted Police. To many of the red-coats who patrol the whole of Canada, the airplane is his mount for horses are now few in number in the force and are not used at all in the Far North.

Distances are annihilated by use of the plane, and great spans are covered every year by the men who make up the famous police force. Vast regions are patrolled by use of the plane, regions where few whites, Indians or Eskimos live, but which must be covered in the annual work of the force. The hardships of travel in the Far North are disappearing for those of the force who can use the "workhorse of the north"—the modern cabin passenger plane.

When the Mounted Policeman today is ordered to get his man, the airplane is likely to play a leading part. Such was the case in the winter of 1931-32 when the plane went into this phase of the Mountie's work on a large scale and for the first time.

A hermit trapper, making his home in an isolated part of the Mackenzie River country north of the Arctic Circle, was reported by Indians to be disturbing their trap lines, taking the animals caught and hanging the traps from trees. Tampering with trap lines is nearly as great a crime in the northland as murder. And the police went on the trail, two officers forming a patrol which set out from Aklavik, to locate the trapper whose reputation for unfriendliness was widely known in a country where the open door to travellers is customary.

The two constables arrived at the trapper's cabin. It was early in the winter, the weather was well below zero and they had travelled with a team of dogs and a sled to carry their supplies. They had been on the trail for several days for the cabin was far from the post at Aklavik.

The trapper did not welcome them with open arms. In fact he did not open the door for them. He fired at them instead and one Mountie was severely wounded. The other loaded the wounded constable on the sled and his dogs travelled in record time to Aklavik, tired though they were.

A new posse went out—stronger this time. The trapper was still at home. He gave a similar welcome to the new police force and a siege began. Supplies for the police ran low while the trapper was evidently well supplied and had dug himself in. Two constables were left to watch, the rest of the posse returned for reinforcements and supplies for several weeks. When they came back, the watchers reported their quarry had flown.

**This seaplane, in the service of the Royal Canadian Mounted police, is very useful as it can be readily landed on the many inland lakes located in the remote portions of Canada.**

Despite the fact that heavy blizzards had obliterated the trapper's track, they came on his trail in a week's time. They found him in a hastily constructed fort, closed in on three sides. Shots were exchanged. Then there was silence. One Mountie went to see if the trapper was dead. A shot from the fort caught him half-way and he died instantly. The posse then set a watch. Soon after a plane appeared overhead, came down in the first possible clearing in this bush-covered mountainous country and reported to the officer in charge. The plane had been ordered north from Edmonton by Ottawa via radio. It had tear gas bombs on board and was ready to aid in the attack on the trapper's fort.

The pilot went aloft to aid the ground attack. He came down a few minutes later to report that tracks led away from the fort. The trapper had again escaped and made his way through the cordon of police.

The plane took the dead constable aboard and headed for Aklavik to bring in more supplies. Then for several weeks that plane flew back and forth over the bush country, searching for tracks in the clearings while the ground force combed the bush. After weeks of fighting cold and flying over dangerous country, the fugitive was located on one of his intricate back trails by which he had given the slip to the cleverest trackers in the northland.

This time he went down, but not before he had wounded several of the police. And the aerial ally of the Mounties hovering overhead, dropped down, took the body aboard and headed for Aklavik to report the end of the Arctic's biggest man hunt and the first one in which the airplane had played a prominent part. It ferried supplies, news and reinforcements as well as scouting for trails.

A few years ago, a radio message from northern Ontario arrived at Mounted Police headquarters at Ottawa and requested that a plane be immediately sent to the isolated trading post from where the message had been sent through the Ontario Forestry Radio service maintained in connection with the aerial firefighting force of the province. A big Indian had run amuck and had been caught, but the factor at the post wanted him taken away from the small trading settlement. A plane came two days later with a Mounted Policeman on board, who took the Indian out by air to the nearest hospital for examination.

Inspectors make an annual round of the various posts in their district. This means hard travelling by canoe and perhaps dog team in the northern divisions. It may take weeks to reach out from one isolated post to another. Storms may delay the inspections still

(*Continued on page* 66)

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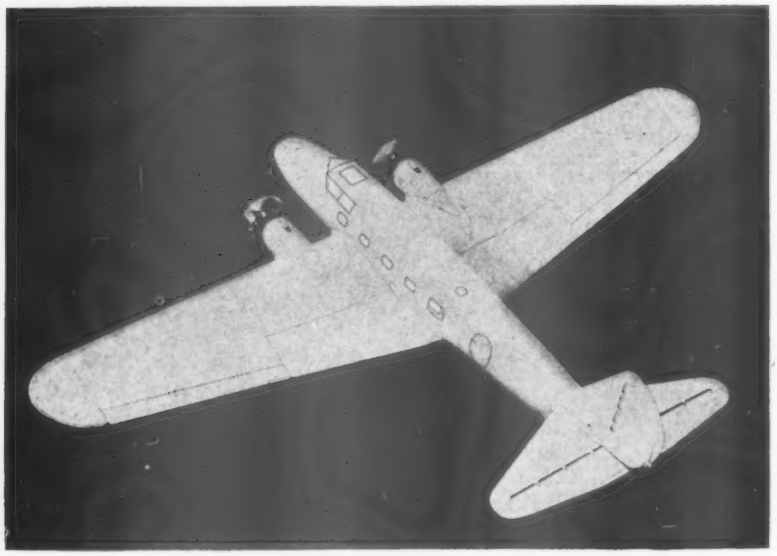
## The Boeing Twin-Engine Low-Wing Transport



Scale Model of the new Boeing Transport plane.

RESPONDING to the demand for higher and higher speeds in passenger airline ships, the Boeing Airplane Company have designed and are now building a brand new type of passenger transport plane.

This new plane, of which the scale model is shown above, is an all-metal, low-wing monoplane engined with two Wasp engines carried on the wings. Apparently, it has been derived from the design of the twin-engined low-wing bomber that the Boeing Company built for the U. S. Army Air Corps last year.

Claimed to be the fastest multi-engined passenger carrying transport in the world, this plane is designed to carry 10 passengers, two pilots and 400 pounds of mail at a top speed of 175 miles per hour. The cruising speed is to be 155 miles per hour.

This is just one more example of the present tendency toward rejecting the tri-motor in favor of the twin type for fast passenger service, and the results will be watched with interest.

## Pitcairn Produces New Cabin Autogiro

PITCAIRN has recently completed the largest cabin Autogiro yet constructed in this country and it is a marked contrast to the "O. C." types previously turned out in the United States although not novel in England.

It is a four-place job provided with a 400 h. p. engine and presents many novel details. For example, double rudders and vertical fins are employed.

View of the new Pitcairn cabin type Autogiro, a well appearing job and claimed to be very efficient.

## Photo Phans Club

THIS month has been a banner month for the Photo Phans Club. We have had more entries during the past thirty days than ever before, and you will find them in the Barter and Exchange columns at the end of our Reader's Section.

A change seems to be taking place in the preferences of the Phans. This month shows that there is more demand for modern commercial and military planes than for the old time favorite Spads, Camels, Albatross and similar wartime ships. Perhaps they intend waiting for a future demand, years hence. Who knows?

And here's a good chance to mention an important subject that concerns all members of the club. The Barter and Exchange columns, which are a part of the Photo Phans Club, are a purely amateur affair for trading or for purchasing photos or other odds and ends. If anyone wishes to sell photographs for cash, then he belongs in the advertising Directory and not in the Barter and Exchange columns. Cash dealers will be welcomed into the Advertising Directory at a very low rate.

## William S. Brock Dies

IT IS with deep regret that we announce the death of William S. Brock which took place on November 13, 1932. After living a life of adventure unscathed, he was finally conquered by that dread disease—cancer.

Born at Gladstone, Ohio, he began his aviation career at the early age of 16 years, a career that he followed almost daily for twenty years. He was an instructor in aviation during the World War and later became one of the unsung heroes who fly the U. S. Airmail.

His greatest adventure was his transatlantic flight in 1927 with his friend Edward F. Schlee. This flight, made in the "Pride of Detroit," was the first non-stop flight from America to England.

They continued their trip by air as far as Japan. After the flight, the Schlee-Brock Aircraft Corporation was formed.

## Dog Flies to Hospital

AFTER being lost five days in a blinding snow storm in the mountains of California, a two-year-old wire-haired terrier managed to discover his owner's ranch but only after having frozen three of his legs. The dog's owner, a physician and surgeon and also an air pilot, heard of his plight.

Communicating with the ranch he at once prepared his plane and in one hour and forty minutes completed the two hundred mile round trip bringing the dog with him. This was America's first air ambulance for a dog patient. A veterinarian attended the dog and was forced to amputate one of its legs.

# Squadron Insignia and What They Mean

*by* LAWRENCE A. CLOUSING, LIEUT, (j. g.) U. S. N. R.

**Much interest is attached to the various insignia that are painted on the fuselage of our military planes, and many of our readers have expressed a wish for having this matter explained. Model builders will find these illustrations adaptable for tracing purposes.**

HAVE you ever thought of making a collection of the separate insignia carried on the airplanes belonging to different squadrons of our Army and Naval air services? They are usually interesting. During the Great War many individual pilots carried their own insignia on their airplane. For instance, there is the widely known flying stork, which that famous French ace Guynemer had painted on his airplane.

During the war, when the different squadrons of airplanes began to run up their victories, they adopted different devices of various designs for insignas to show pride in their organization. This practice of adopting squadron insignia has been carried on and now on the airplanes of the various squadrons of the United States Naval Air service will be found a number of interesting insignia. These are not officially given to the squadron; they are worked out by the members of the squadron themselves and often contain amusing motifs with an interesting background.

Perhaps the most widely known of the Naval air squadron insignia is the "High Hat". This is the device of "Fighting Squadron One" of the U. S. S. Saratoga, Battle Fleet. This squadron furnished the first Navy stunt team to attract nation-wide publicity because of the precision of their flights at the National Air Races held in Los Angeles in 1928. They again performed at the air races in 1929. The "High Hat" was again called to public attention in the moving picture "Hell-divers".

The "High Hat" was adopted for no special reason. "It just seemed to be a good idea at the time," one in the squadron remarked. The idea came when one day one of the pilots showed up wearing a old battered high hat. It

**Insignia of the "High-Hat", squadron "One" VF-1-B, attached to the carrier Saratoga.**

was just the thing, and the aristocratic symbol became the squadron device forthwith. Previous to the adoption of this symbol in June of 1927, the squadron had as an insignia, a diving eagle. It was discovered that the insignia was similar to a parrot which was being used to advertise a certain brand of chocolate. So the insignia had to be changed with no further delay.

THE opposite is true of the insignia of Patrol Plane Squadron Ten, attached to the U. S. S. Wright. Here practically every purpose of the squadron is represented. Navigation is represented by a compass rose as a background on which are painted seven stars representing the great dipper and another star representing Polaris or the north star. The squadron does considerable navigation on long overseas patrols. Sparks are significant of the radio with which the planes are equipped so that they can send and receive the necessary orders in formation. As a secondary purpose of the squadron is bombing, a bomb in the center of the circle indicates this purpose.

The insignia of Fighting Plane Squadron Three, attached to the U. S. S. Langley is an American eagle descending in a dive with wings and claws outstretched ready to strike. This is imposed on a background of a yellow five pointed star on a blue circle. The symbol is representative of a fighting plane diving to strike its enemy with machine guns or bombs.

Old King Neptune sitting upon a rock, is the humorous, yet explanatory symbol of the plans of Patrol Plane Squadron Eight. With trident in one hand and the other hand on his brow shading his eyes, he scans the horizon for a possible enemy as master and king of his vast domain. This corresponds with the primary and important mission of the squadron in patrolling the high seas.

Patrol Plane Squadron Four comes under the Battle Fleet and is temporarily stationed at the air base at Hawaii. Here the full rainbow is frequently seen during the flights of the squadron in and about Hawaii, so the members adopted as a symbol a complete circular rainbow. For good luck they threw a four-leaf clover in the center of the circle.

Pat Sullivan's, "Felix the cat," was chosen to bear the standard for Fighting Plane Squadron Six attached to the U. S. S. Saratoga. He is shown carrying a lighted bomb in his hands. At the time this symbol was adopted, the purpose of the squadron was light bombing by means of dive bombing. Now the mission of the squadron is simply that of fighting, but the old symbol is retained—it is so good.

An old fashioned patrolman with a

**Patrol Squadron Ten, the "dropping bomb" insignia. VP-10.**

**Patrol Squadron Eight, Neptune on Rock. VP-8.**

**Fighting Plane Squadron Three, Eagle and Star. VF-3.**

"night stick" was chosen for the insignia of Patrol Squadron Seven attached to the U. S. S. Argonne. This was the first squadron to be assigned to "Patrol" duty. Since the squadrons operations are often carried on at night, the night stick is significant.

A dragon blowing his breath of fire and smoke represents the planes of Torpedo Squadron Two based aboard the U. S. S. Saratoga. Its red snake like form is indicative of the utility of the squadron in laying smoke screens, launching torpedos and dropping bombs.

Another interesting symbol which appears on some of the Navy airplanes is that of a flying turtle. This is not limited to planes of a certain squadron. It is just applied to those airplanes of the U. S. S. Saratoga which were aboard when she crossed the equator during the maneuvers of 1929. It is placed on the airplanes as a small symbol and is carried in addition to the regular squadron insignia.

Besides these squadron insignia, Navy airplanes have other symbols, numbers and letters of various kinds. These markings are the cause of interest on the part of the uninformed, but their significance is seldom appreciated. They appear understandable only to the seafaring airmen. Some are not very hard to figure out.

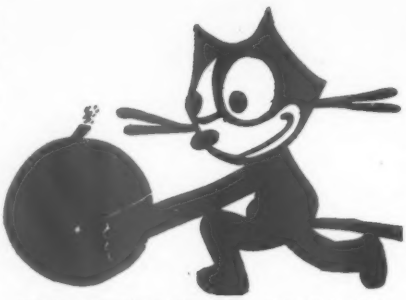
First it will be noted that on the wings of the airplanes is painted the international U. S. designation for military airplanes. This is the circle within a star within a circle.

Rudders of the airplanes are marked with three vertical stripes of red, white and blue of equal width, unless the airplane is attached to some particular squadron, in which case the squadron is given a certain color, and the entire tail surface of their airplanes is then painted in this color.

Usually, the fuselage and wings are painted aluminum color and "U. S. Navy" is on the fuselage near the tail. The upper surface of the top wing is painted in chrome yellow to make the airplane easily visible from above.

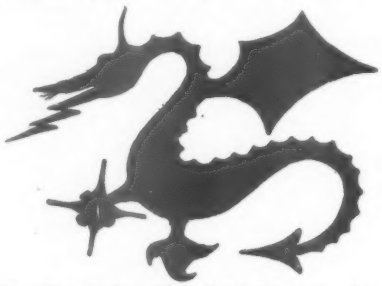
The number corresponding to a commercial machine's license number is the "Bureau number". This is on the vertical stabilizer. The type of airplane is shown on the rudder generally. An example of this type designation is O2C-2 meaning, "Observation plane of the second major type manufactured for the Navy by Curtiss". The last number indicates that two minor changes have been made in the original model.

Along the middle of the fuselage are large numbers and figures. These denote the plane's squadron. For example, take 1-S-6. The "1" stands for the squadron, the "S" indicates the purpose of the squadron—scouting, while the last number "6" indicates the plane's number in the squadron. Altogether this means, "Plane number six in Scouting Squadron One". Other letters may be used in the middle depending on the squadron. "F" stands for fighting, "P" for patrol, "O" for observation, "T" for torpedo, and so on.



Fighting Squadron Six, "Felix the Cat." VF-6.

Patrol Squadron Seven, the "Cop". VP-7.



Torpedo Squadron Two of the Saratoga. The Dragon. VT-2-P.

The "Flying Turtle" insignia of the U. S. S. Carrier Saratoga, gained when she crossed the equator during the maneuvers of 1929. The planes that crossed the equator also carry this insignia.

Bands about the middle of the fuselage indicate that the pilot of the plane is either a squadron or a section leader. Colors of the bands are different for different sections.

As each new squadon is formed, a new insignia is conferred upon it, so that there are a multitude of insignia.

For the benefit of our readers we have printed four of these insignia in black and white, and of about the same size used on a model, so that the model builder can easily trace the figures and transfer them to his model.

## One Thrill of a Lifetime

By JOAN THOMAS

ONE day last summer I was out at the airport and as it had been raining off and on, I had waited until late in the afternoon before I took off. After shooting a few landings I decided to go up a few thousand feet and spiral in.

Intent on watching the take-off over some trees and a green-house at the corner of the field, I did not glance down at the instruments until I had gained a little altitude. Then as I looked down . . . for one breathless second . . . I sat paralyzed! The whole front cockpit was a mass of flames; long, flickering tongues of the blaze were licking back along the fabric.

Fearful stories of fire in the air, flitted through my mind . . . the words of my first instructor, "probably the only time you will ever need your parachute is in case of fire in the air. Then there is only *one thing to do* . . . bail out!"

It was horrifying, this sudden appearance of fire—the worst enemy that the plane knows and the constant dread of the pilot. But there it was—no doubt about that.

Quick as a flash I grabbed the buckle of my safety belt, but in the same instant, realized that I was too near the ground to jump. What then? I remembered someone had said, that a fast side-slip would fan the flames away from the pilot and might even snuff them out. In the split-second that this flashed through my mind, I had shut off the gas, flipped the ship over on the left wing and brought it down with a rush in a steep side-slip. Instantly, the light died out, the manuever had worked like magic.

Then I realized what had happened. The ship I was flying (for the first time since it had over-hauled) had been yellow before, but had been re-painted a bright red. As I had taken off for my spiral, climbing into the south-west wind, the sun came out from under a cloud. The sudden light shooting up under the wings, through the red fabric on the fuselage, quivering and shaking with the vibration looked exactly like a mass of flames. And some bits of string around a bracing, flipping madly in the wind completed the illusion of tips of flames licking back along the sides towards me.

It was all over so swiftly that I had switched on the motor, leveled off and was climbing again before anyone on the ground had noticed my impetuous descent over the neighboring golf course. As I spiralled down in slow wide circles, I had time to realize how nearly I had come to being a candidate for the Caterpillar club. For if I had been at 2000 feet, instead of 200, when the sun flashed out from under that cloud I wouldn't have hesitated. "What an experience!" said a friend, "but wouldn't it have been embarrassing after the ship came down?"

# Early Setbacks in Autogiro Development

*by* ALVIN EDWARD MOORE

**The author, connected with the U. S. Patent Office, Washington, D. C., is thoroughly conversant with the many tribulations encountered by Cierva in the early development of the Autogiro.**

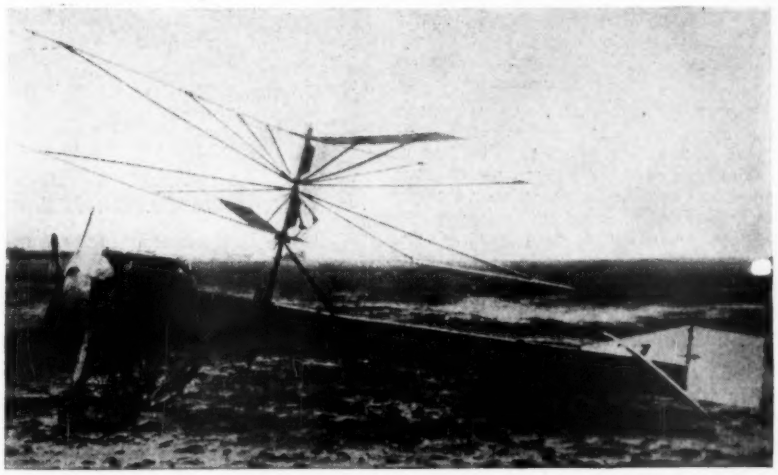
ON MARCH 31, 1923, de la Cierva filed his application for a United States patent on his invention of the autogiro. In common with most applications of other inventors, its progress in the Patent Office was extremely slow.

For almost three years it lay in Division Twenty-two, all its claims being completely rejected twice as involving no invention.

The amended case came into my hands for further examination in January, 1926. Trained by Mr. James H. Colwell, who as Chief of Division 22 had analyzed and guided the technical development of aviation since its infancy, I was disposed to give the altruistic aeronautical inventor all the protection that he was entitled to receive without quibble or hesitation. I immediately saw that the patents cited in the previous rejections did not anticipate the claims.

I made another and thorough search and found two patents clearly showing wind-rotated wings and three showing pivoted wings or propellers, but not one which showed a wind-driven, hinged, rotating wing. I therefore recommended that a patent be issued to Juan de la Cierva, whom I did not know at that time any more than the man in the moon.

I have been unofficially criticized since by less liberal examiners who believe that the claims were anticipated by a French patent to Louis Breguet, which shows power-driven, hinged wings. I officially concluded in 1926 and unofficially still believe that de la Cierva's seemingly slight improvement entitles him to a place in the sun as one of the world's greatest inventors.



This is the first Autogiro constructed, but it was unsuccessful. Note the double rotor system which Cierva believed would balance out the torque and flutter.

By promptly recognizing his startlingly practical solution of the age-old problem of vertical flight, we may have avoided the bitter criticism of the Patent Office which was engendered by the delay in issuing the first patent of the Wright Brothers.

It is said that Wilbur Wright died without having realized many of the fruits of his epoch-making work because of the technical delays of the Patent Office and the higher patent tribunals. Don Juan de la Cierva today is enjoying the best of health and an unchallenged reputation as a great inventor. History—like that of the Wrights—will never die.

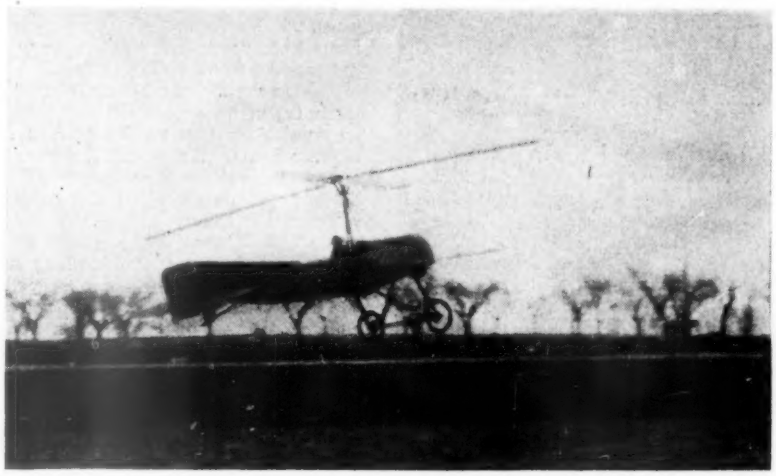
It was peculiarly fitting that in Spain, where old Don Quixote so valorously sallied forth to do battle with windmills for beleaguered virgins, young de la Cierva should revive the windmill and lift it to a thousand times its previous importance. In fact, he put it in the air for all the world to see—and a few decades hence—unless I am a prophet without honor—all the world will be flying under windmill wings such as his.

IN THE fall of 1918, when the World War was at its hottest, Sunny Spain suddenly awoke to the realization that the other European nations had leaped ahead of it in aviation. When the indolent charming Spaniard did go into action, however, it was in a grand way.

In the spirit of the *fiesta*, the air-minded and curious of old Madrid gathered to witness the first open competition of Spanish-designed planes. A prize of ten thousand dollars and a contract with the government was to be awarded to the winning designer of each type of plane entered: the pursuit, the reconnaissance and the bomber.

The size of the bomber and its difficulties of construction had caused all the designers but one to avoid this class. That one was young Juan de la Cierva, about to graduate as a civil engineer from the Civil Engineering School in Madrid.

This handsome young scion of an old Spanish family had never been overburdened by humility or a sense of his own limitations. He was, in fact, quite sure of his merit as a designer of airplanes. He had that egotism of the



The first successful flight with an Autogiro at Getafe Airdrome, Madrid, 1923. You can imagine the thrill that Cierva felt at this moment after years of battling.

inventor which, throughout the ages, has made man tackle what has been called impossible.

With the aid of a small group of backers, including Count de los Moriles, he had built a bomber of orthodox design at a cost of some $32,000. His whole future career, he was convinced, hinged on this trial flight of his giant plane. Thus, he was a bit nervous as he examined it for the last time before the flight.

The bomber was a large biplane, powered by three Hispano-Suiza, 180-horsepower engines. With a wing span of eighty feet, designed to carry fourteen passengers, it was the largest plane and the first tri-motored plane that had been built in Spain. The workmen had been forced to tear down the wall of their workshop to get it out for its trial flight.

"Are you all right, Captain?" young Juan asked the pilot anxiously.

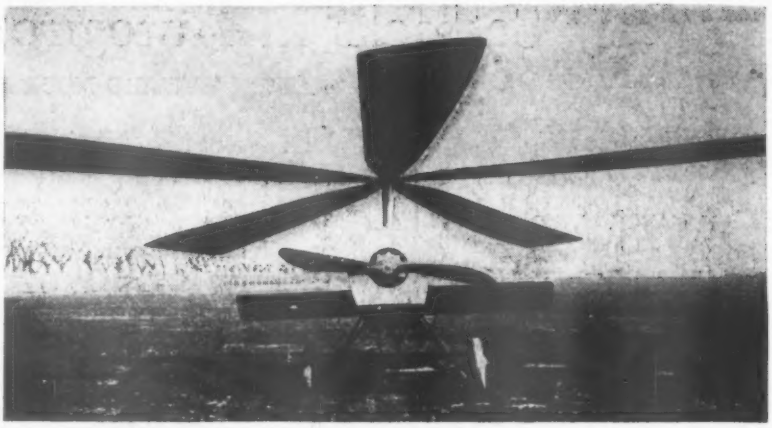
The man lit a cigarette and nodded nervously. *"Si, senor."*

The pilot's name was Rios—a little man who had been wounded while flying against the Riffs in Morocco. As most of the planes he had flown had been of the fast pursuit type, he was somewhat nervous at the thought of handling this great bomber.

The signal was given and the three engines roared. Young Juan watched anxiously while the bomber rose slowly into the air like a giant bird.

Captain Rios at first flew cautiously, but in a few minutes his nervousness was replaced by his love of the spectacular. He began to fly fast and low as though in a pursuit plane. Doubtless he wanted to show the spectators how he had strafed the Riffs in Morocco. Then too, de la Cierva had wanted a good demonstration.

SUDDENLY, young Juan, watching every move of the plane, held his breath in dread. The plane had hesitated. The next moment it crashed to the ground—a mass of wreckage!



The third type of Autogiro in which a five bladed lifting rotor was used as an experiment. Not successful.

With it fell Juan's high-flying young ambitions. Something of his youth—so cocksure and full of vanity—lay in the debris. He tasted the old, old disappointment of the youth who comes to manhood and sees his roseate plans fail through no fault of his own.

He rushed forward with the others. They dug Captain Rios out of the wreckage. He was bruised and scratched, but otherwise unhurt.

Juan examined the plane that embodied thirty thousand dollars of his and his backer's money and so much of his youthful strength and enthusiasm. What a few minutes before had been a thing of law and order and harmony, now was a chaotic mass of broken wings and struts. He was bitter with the bitterness of youth that has not known defeat, that has not yet learned how little the individual weighs in the universe.

What had he left undone? What had he done wrong? The plane had been flying well, and then—suddenly—it was no more.

Rios had been flying too low, that was it—too low—and an airplane couldn't fly low. An airplane, no matter how carefully built, was too subject to chance—too inherently unsafe.

He shrugged his shoulders. *Pues!* It was wrecked. Their money was gone, the prize was gone, the contract was gone. Did this mean that the long-planned career in aviation was not for him? He thought of the degree he would receive very soon, *ingeniero de caminos, canales y puertos*—engineer of roads, canals and ports.

While in high school, a young friend named Pablo Diaz whose father was a building contractor, his younger brother and himself built gliders and flew them from a fifteen foot bluff until repeated accidents dampened their youthful and ardent enthusiasm.

Young Juan continued to study the theory of aviation. He learned about the different makes of planes, and was sure with the definiteness of youth that he was going to be a pilot or a designer when he became a man. He studied advanced mathematics, physics and engineering in his spare time.

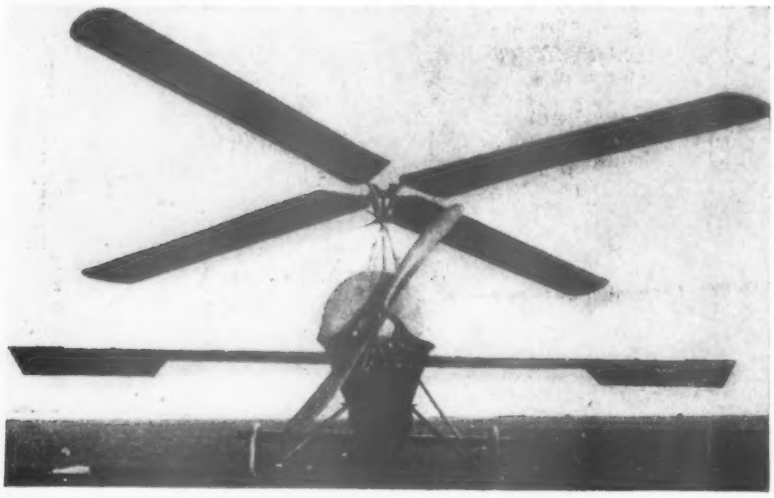
At this time, Jean Mauvais, a genial Frenchman in Madrid, owned and flew one of the few planes in town. He took time in his kind way to explain practical details of aviation to young Juan and the other two eager-faced youngsters, who worshiped him.

One day poor old Mauvais cracked up in trying to avoid a crowd of foolish spectators who rushed toward the landing plane. He swore off flying, as a cigarette smoker often swears off his beloved smokes—only to return later.

The boys eagerly bought the wreckage of the plane. They rebuilt it of odds and ends, using cheap, glued canvas for the wings and for a propeller the wine-soaked wood from a discarded counter of an inn bar-room. They painted the wings a deep scarlet, that color so loved by Spain, and named the plane the "Red Crab".

They then persuaded the good-hearted Mauvais to test it out. It flew. In fact, it flew around Madrid until it literally disintegrated.

(*Continued on page* 59)



This is the first successful Autogiro, the flight of which is shown on the preceding page.. A four-bladed rotor is used.

# Just Another Brainstorm

*by* JOHN B. RATHBUN and HERMAN BOLLIN

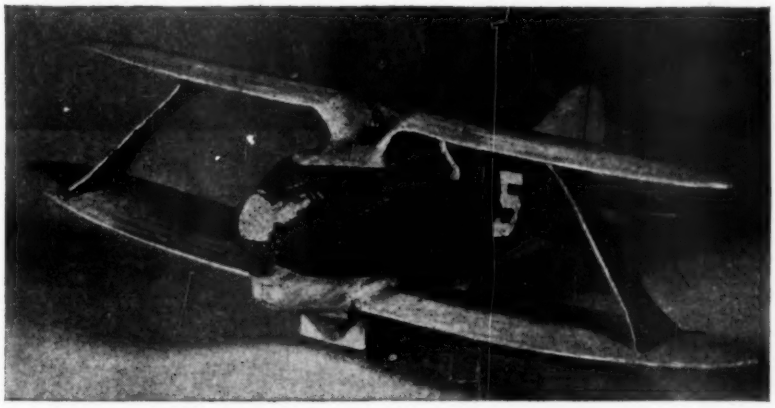
A few ideas on the subject of super-speed craft by two members of POPULAR AVIATION'S Staff. The model was designed by J. B. R. and built by our artist, Herman Bollin.

SPEED mania! Pylon dusting, wing tip scraping, 400 m. p. h., and all the rest of it. A gay life but a short one. That's the bug that has settled for a brief few weeks upon the members of the editorial staff of POPULAR AVIATION.

And out of this series of halucinations was born a speed-buggy, windsplitter, or whaddye call it, that the editors—and Mr. Herman Bollin—believe to be the last word in whizzbangs. It, in their opinion, is the go-getter that will bring in the tall silver mugs and the conventional 10 per cent of the gate receipts.

Just where to start on this project was the first question that entered the bean of J. B. R. when his temperature began mounting. Cut down the head resistance—sure—but how. Naturally his mind turned to thoughts of more perfect streamlining, retractable landing gears and all the other cut-and-dried tricks of the trade, but they didn't offer a sufficient improvement over what had already been done along these lines to make them worth while.

Smaller wing surfaces and heavier loading, of course, was essential but they so tremendously increased the landing speed that this was impracticable. So far as the wings themselves were concerned, it looked as though the only solution lay in the use of variable area wings, contracted at high speed and expanded to their full area at landing. But, again, this meant a weak uncertain construction with wings that were already strained to the smashing point and a dozen solid spars were none too many.



Three-quarter front view showing the gull wings, caterpillar landing gear and the interplane ailerons. Note that no propeller is employed.

No doubt but what we could get all the speed necessary by loading on the horsepower until each weary h. p. was loaded to less than 1.8 or 2.0 pounds. But this did not crack the hardest nut—the necessity for a reasonably low landing speed. Something had to be done about this—and was.

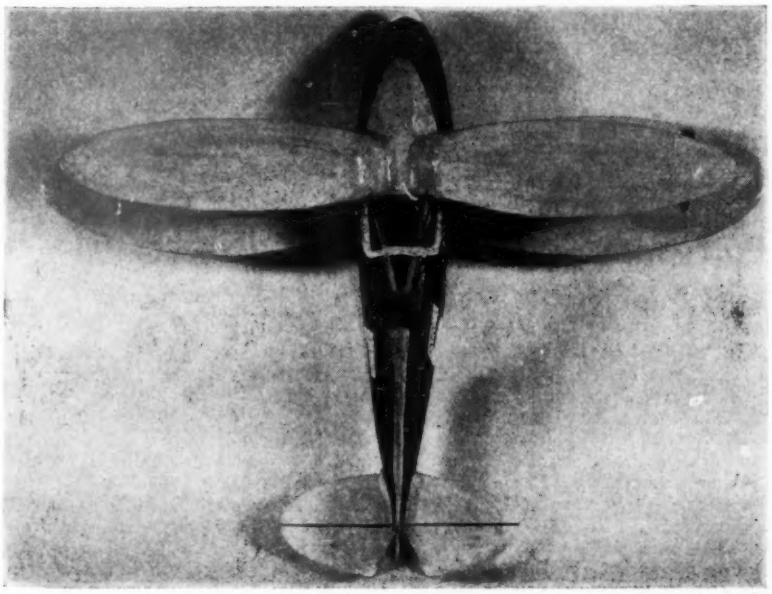
The idea of variable area wings was canned. And to take the place of this difficulty, an inverted sesquiplane combination was finally adopted. Thus, at landing, the full lifting effect of both surfaces of the biplane pair was in operation giving the required lift at a reduced speed. At high speed, only the area of a single wing became effective with correspondingly increased loading so that the required top speed could be attained.

Different wing sections for the biplane group were selected. The upper wing section was one that showed the least drag at zero lift. The lower wing, that was to carry the ship at both speeds, must possess a good lift-drag at the small angles demanded at maximum speed. That was the solution.

And to further decrease the landing speed, the low wing was necessarily placed very low—as near the ground as possible to get the benefit of every ounce of lift due to the air cushioning effect. The compression between the earth and a wing about two feet above the earth has a very appreciable effect in reducing the landing speed. So it was decided to get this lower wing down as far as possible at any cost—and that was that.

And then came further refinements in the wing. The theoretically correct elliptical wing was chosen—cost be hanged. We were out for speed and not production economies. Hence, if you will look at the attached photographs of the model, so carefully concocted by Mr. Bollin, you will see gull-wings—plus. They cut the air with the least possible disturbance and power loss and that's exactly what we were after. Both the chord and wing thickness tapered out toward the tips, with both better lift-drag and pressure distribution.

Do you think that we would, for one moment, lose the advantages that we had so carefully gained by putting ailerons in these wings? I should say



Top or plan view showing the elliptical wings, stabilizer-elevator, cockpit cage and the form of fuselage adapted to high speed.

not. The ailerons must be and are of the floating type, but inclined with the vertical instead of lying in a horizontal plane. The aileron flaps surround the two interplane struts, thus killing two birds with one stone—or words to that effect.

By the strut arrangement shown, the wings can be made of the self-supporting type without the use of external wire bracing of any sort. When the load is greatest on one wing it is practically zero on the other wing, so that both the top and bottom wing spars are effective in carrying the load on the active wing.

The load is transferred by the inclined struts, which by the way, incline in the proper direction. This slant is just opposite to the direction that would be selected had wire tension members been employed. And the struts are automatically streamlined by the ailerons placed around them.

Your next comment will be—I can hear it coming now—"the ship is so low that there wouldn't be room to swing a prop of the proper diameter."

Well, this would be an objection if we used a propeller, but it is really no objection in this case because we don't use one. This is a turbine reaction type ship, propelled by jets of air expelled from the rear of the wings and also from the rear of the fuselage—just like a rocket but without so much smoke.

Dispensing with the prop enabled us to get the ship so low that she practically lies on her tummy. And by getting her down low, it enables us to employ another innovation—a caterpillar landing gear that takes the place of the more usual landing gear of the occasionally retractable type.

Yessir! You see, it this way. The engine drives a turbine blower, both located in the engine compartment and streamlined to perfection. This turbine blower compresses air to a pressure of about 32 ounces per square inch, and the compressed air is then directed toward the rear where it exits through nozzles in the wings and at the rear of the fuselage. You would have seen these nozzles in the picture, but I hated to load any more work on Herman Bollin, so they were not installed. They exist morally but not physically—if you get what I mean.

By properly choosing the area of the reaction jets, in this case the total jet area is about 100 square inches, we get a thrust of practically 3,200 pounds with everything wide open and with the ship resting upon the ground. To get about a ton and a half of thrust should sure make her take-off and I don't mean maybe. This contrasts with racing ships provided with and dependent upon fixed blade propellers.

And by this adoption of the reaction propulsion idea we gain a number of advantages at one full swoop. Less ground clearance is necessary, we can

(*Continued on page 54*)

## Howl Department for Amateurs

**An open forum in which our amateur builders and pilots can speak their minds in respect to the various factors that affect amateur aviation.**

**Amateur airplaning and seaplaning are the world's greatest outdoor sports. Here we have the light seaplane built by A. O. Este of Canada.**

LETTERS from the Howlers are coming in a deluge, and we only regret that we have no room for all of them. In fact, we could fill the whole magazine with howls and still have some left over. They come from all states, even from Europe, but each one has the same hard luck story to relate.

And so we are forced to print them in the order in which they are received—first come, first served, or words to that effect. We try to print as many as it is humanly possible and eventually *yours* will appear. We are taking them catch-as-catch-can, showing no favoritism nor picking them on the basis of merit. Everyone has his opportunity to howl, catcall, razz, snort, yodel, yip or what have you.

And just about the time that we have drawn up our ideal petition, along comes some guy with an idea that makes a change desirable, and so it goes. When she gets done, though, she'll be some petition, mark my words.

And so come on, you howlers, with more ideas before we close up and decide upon our formal petition blank. Stand up for your rights!

* * *

J. B. BURNETT, Weirton, West Virginia, sends in a very interesting letter that shows close personal contact with the situation in his state. He can help us, just as our other friends can help us, by keeping us advised of conditions in his state just as he has done in the following letter.

*I know of at least three planes under construction by very good mechanics who have ceased work as they understand that their planes cannot be flown in this or that state without a Federal license. But I do think these ships should be inspected by a Department of Commerce inspector, or at least by a state inspector. And if not air-worthy should be grounded.*

*Why not investigate their ability to build a plane and encourage instead of discourage as some of the other countries are doing?*

*I am enclosing a photograph of my last ship which you will notice is a Heath Parasol, Model V. This is a welded job and has been built from raw materials by myself.*

*It was test flown last February and proved very successful, taking-off within 200 feet with very good climbing ability and flying very well. With the exception of putting a little washout in the left wing, this was all the change necessary to put the ship in good shape.*

*I also want to state that your magazine has been a helping hand to me in building this plane. I am very much interested in "Our Column" and hope that it continues.*

*I am yours very sincerely,*
*J. B. Burnett,*
*Weirton, W. Va., Box 492.*

Well, here are three more home-built planes tied up by the restrictive laws after their builders have spent a lot of money, time and thought on the job. And all to no purpose for the reason that state or Federal inspection is no insurance at all that the plane is safe or successful. It gives the writer, J. B. R., a great secret pleasure to see some of the flops turned out by the big companies that proudly bear all sorts of insignia and A. T. C.'s. It takes more than an A. T. C. to build a successful plane—take it from me.

Judging from the number of letters that we are receiving from the states of Ohio and West Virginia, the state laws in these localities must be hitting them pretty hard or else there are an unusual number of home-builders in these states. And now we hear from A. G. Fowler, R.D.-1, Hurricane, West Virginia, who airs his views in the following excellent letter:

*I think the new "Howl Department" is just the thing we need. I wish to express my views in regard to a solution of the license problem now confronting us.*

*I believe the Department of Com-*

(*Continued on page 46*)

# How an Airplane Radio Functions

*by* LAWRENCE J. LESH

*An "Early Bird"*

**Details, including a short-wave circuit, of a successful airplane radio receiver and transmitter. This is of importance in view of the laws now about to be passed.**

BROTHER, when the soup is thick and the ceiling is on the ground, radio will guide you home and nothing else will.

Register that fact in your brain, fledgeling, and burn midnight oil until you can answer all of the questions so that in the future they will speak of you as "man-taking-airplane-for-a-ride" and not "airplane - taking - man - for - a - ride."

Learn to fly your course by railroads and other things you see on the ground, learn to fly by the sun, moon and stars with the aid of compass and drift indicators, learn to fly by "hunch-and-by-gosh" and then see what good all this does you after you have been in the fog for an hour or so and the wind has shifted. Radio works all the time and here's how.

**A two-tube push-pull transmitter for 5 meter transmission, showing the single turn tuning inductance closely coupled to single turn aerial coil.**

Way back in the Spring of 1912, the U. S. Navy told Lieutenant George Lewis, who is now the dignified Vice President of the Arcturus Radio Corporation, to take a radio transmitter up in an airplane and see what would happen. George did it at San Diego and also unreeled three hundred feet of wire with a lead weight on the end to serve as an aerial. A pair of sheep wool clippers solved the problem of what to do with the wire when he was through with it. A battery supplied power for the transmitter.

For no particularly good reason, the writer in collaboration with Emil J. Simon of New York, decided also to inflict more weight and head resistance on airplanes of that early vintage. In the Fall of 1912, he journeyed to Hammondsport with an assorted collection of radio apparatus which, it was hoped, could be elevated into the atmosphere by a Curtiss pusher. G. L. had his doubts and also viewed with alarm the peculiar device by which I proposed to rotate the radio generator at some 4000 R. P. M.

**Aircraft beacon receiver removed from case, an exceedingly compact set**

At this early date, and in fact on up to the present time, the problem of how to spin the radio generator was and is Enemy No. 1. Summed up, batteries are heavy and small gas engines to drive the generator directly are awkward. My particular solution consisting of a small air propeller or "air-fan" as we termed it, is a nice little item of drag in flight.

Oh, I forgot the other solution which by this time has occurred to the reader —drive the generator from the airplane motor by belt or gears. A good idea! It always was a good idea but twenty-two years have passed without finding an airplane engine expert enthusiastic about the proposition. I rejected the direct motor drive at first because it would kill the radio when it was most needed—when the airplane motor konked—and believe me brother, they konked often in those days of long ago.

Getting back to Hammondsport and into a Curtiss pusher with assorted radio apparatus and a generator driven by belt from an eight bladed farm-type windmill; Hugh Robinson got the works off the surface of Lake Keuka and we flew around proudly sending dots and dashes. Tiring of this, we started down, I reeled in the aerial and happened to accidentally touch the transmitting key strapped to my knee. We were both nearly electrocuted.

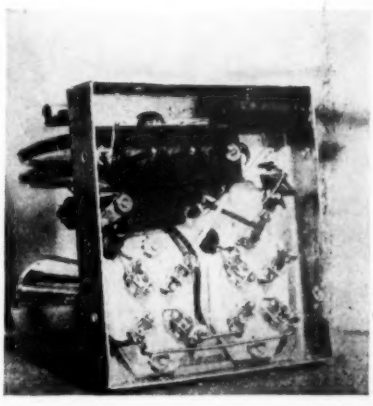
During the next two years, much to the annoyance of aviators, we continued to drape our radio wires and boxes around their airplanes on both coasts and dabbled with the idea of receiving as well as sending on board the planes. Fortunately, other workers were attracted to aircraft radio experimenting when the World War loomed over the horizon and it was soon possible to send 'em and receive 'em both by key and voice.

The writer overcame the original objection of high resistance caused by the wind driven generator and patented the scheme of retracting the affair into the fuselage when not in use. Having relieved myself of these brief historical notes anent aircraft radio we will consider some up-to-date phases of the subject.

So, we will leave the generator driving problem and take up the electrical side of the question which directly concerns the receiver and the transmitter.

Today, the aviator is primarily concerned with receivers which will enable him to follow the already established radio beacons on the airways. The layout of these beacons has been so often described and the details are so easily obtainable from the Department of Commerce by which they are maintained, so I will devote most of this space to the actual receiver itself.

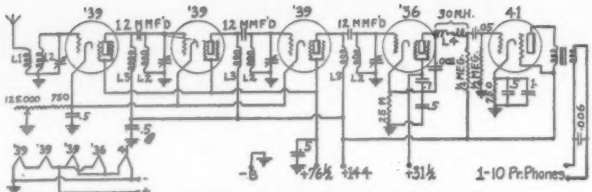
In the near future, pilots will find available another radio guide called the "homing set" which will enable them to map their course from broadcast stations and fly over routes not covered by the established beacons. These sets will operate with a loop antenna, the directional qualities of which are



**Underside of the 5 meter transmitter chassis, showing simplicity of construction.**

already well known to broadcast listeners who owned the loop sets so popular a few years back.

One of the beacon receivers now available on the market and in successful use is shown in the accompanying photographs and a circuit is given which will be easily understood by those of my readers who build or repair their own broadcast receivers.


L1-50 TURNS #35 DSE. AT BOTTOM OF L2 .020" SEPARATION FROM L2
L2-1500 MICROHENRIES LITZ. 7-41 ON 1¼" O.D. TUBE
L3-18.5 M.H. ON SPOOL UNIVERSALLY WOUND AND SET INSIDE L2 AT BOTTOM OF COIL.
L4-R.F. CHOKE UNIVERSAL WINDING 2 SECTION IN OPPOSITE DIRECTION.
NOTE: ALL FIXED RESISTORS IN CIRCUIT ARE MADE UP OF 2 RESISTORS IN PARALLEL IN CASE OF FAILURE.
NOTE: ALL COILS AND TUBES SHIELDED - ALL GROUNDS CONNECTED.
1-10 Pr. Phones

Wiring diagram of aircraft beacon receiver.

This typical set, the Radio-Aire, takes in 14 broadcast channels and also receives the longer waves up to 230 kilocycles as employed by the radio beacons. The set is calibrated directly in kilocycles for quick reference. Together with special aircraft "B" batteries and headphones, the complete weight is only 18½ pounds and the outside dimensions are 7 x 7 x 9 inches. The set shown is installed in a Warner powered Monocoupe owned by William Lear, in whose laboratory it was developed. This plane and several others are constantly in use testing radio equipment on the existing airlines and carrying out research work, particularly with short waves in the order of five meters. These short waves are extremely important in short range communication with very light weight equipment and in the development of radio landing beams to enable the pilot to take off and land in fog.

For the benefit of those who are somewhat acquainted with the details of radio receivers, a complete schematic circuit of the beacon receiver is shown and the sensitivity may be accounted for by the fact that three type "39" pentode tubes are used in radio amplification. Such sensitivity somewhat complicates the problem of interference from the ignition system.

The selectivity and sensitivity of radio sets is no longer a matter of personal opinion or guesswork. Sensitivity is measured with input voltages corresponding to very faint signals of the order of one millionth of a volt.

Complete 5 meter radio telephone transmitter with a range of about 20 miles. It cannot transmit beyond the horizon on this short wave length.

## Rubber Demand Increasing

THE use of rubber in relation to aircraft constantly is being widened. Major Jimmy Doolittle has had rubber "abrasion shoes" installed on his Lockheed Orion and his Laird planes to protect the leading edges. Last year, during the flight in which he broke the transcontinental record, rain battered and damaged the leading edges of wings and tail surfaces on his plane. This year the little rubber sleeves are acting as efficient guards in both locations.

The Army Air Corps has installed streamlined tires on a new low-wing pursuit type plane. These tires, broader at the base than at the tread, show a triangular cross-section when deflated and a parabolic one when inflated.

It is contended that less resistance is offered by the new low-pressure tires in flight than has formerly been the case and that the hazard of nosing over on landing is decreased.

## Aeronautical · Oddities ——— by MARINAC

BOEING ARMY FIGHTER, OUTCLIMBS THE "FASTEST ELEVATOR", WHICH IS IN THE LA SALLE-WACKER BUILDING CHICAGO, TWO TO ONE
WERNER WEICHELT "UPSIDE DOWN FLIER" UPSETS RECORD BY FLYING UPSIDE DOWN WITH PASSENGER FOR 38 2/3 MINUTES!
LEE GEHLBACK, WON PRIZES IN RACE AROUND CONTINENT WITH A TRI-MOTORED MONOPLANE WITH ONLY TWELVE CYLINDERS FIRING!
THE "AKRON" HAS EXACTLY THE SAME NUMBER OF CUBIC FEET OF HELIUM GAS--AS THERE ARE RIVETS - 6,500,000!

# Simple Lessons in Meteorology

*by* JAMES A. SIMPSON

PART IV.

Charley and Jim engage in another attack upon the theory of weather problems via the U. S. Mail system.

Dear Jim:

I should have marked my last letter "dictated but not read," for I find in looking over the carbon copy, which the redhead handed me after I had mailed the original, that I failed to tell you a couple of things about weather maps.

Knowing you as I do, it will be a safe bet that you'll be writing me in a day or so to ask why I held out the dope on you. So to cop the bet I'm going to dish it up right here at the start, before the matter slips my mind.

One of the things I overlooked was "fronts". That sounds as ungrammatical as the deuce, but as a matter of fact it isn't. However, in order to make clear to you what fronts are, I want to give you two new definitions. These are "polar air," and "equatorial air". Explanation follows.

When you run into an area of relatively low temperature and low humidity, that's "polar" air, believe it or not. This doesn't mean that such air comes from the north pole. As a matter of fact it may blow from almost any direction except that.

Usually, however, it has a bearing of from southeast to west, through north. "Equatorial" air, on the other hand, is relatively warm and moist, and most generally comes from the south, or at least from a southerly direction.

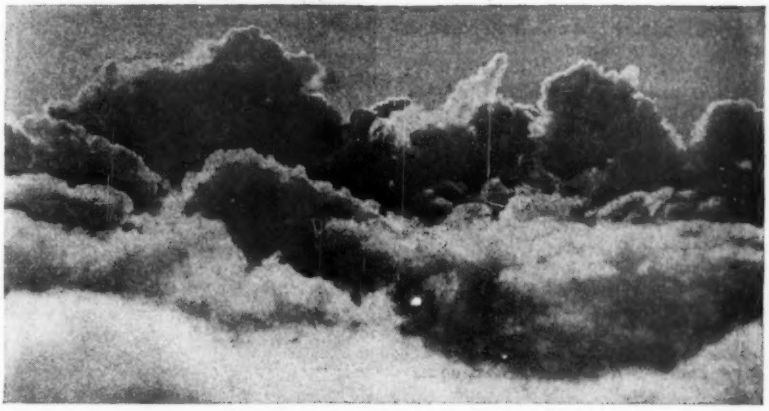
On the weather map, the boundaries between air masses of different origins, such as polar and equatorial, are called "fronts," and are indicated by lines of "discontinuity". Because these lines on the weather map diagram the structure of most storms, one authority on the weather believes fronts are the most important lines that are to be found on the weather map.

If they are of importance to the weather forecaster you can lay a couple of small bets for your Uncle Charley that they are doubly important for the pilot, who, right now, is you.

Having cleared the old conscience on the subject of fronts, I'll take up the next omission, which is not so all-fired important. You'll find out pretty quick after you get your papers that some weather broadcasts give detailed reports of upper air observations of wind, temperature and humidity for certain altitudes.

Far be it from me to have you grow up to be plain dumb on this point, because data like that is mighty useful in figuring out possible conditions favorable to the formation of line squalls, thunderstorms and other rough and tumble atmospheric ruckus.

As a matter of fact, when you've got a lot of upper-air data it will prove handy to enter it on a special multiple-chart weather map, on which it is possible to keep track of conditions at levels of 250, 500, 1,000, 1,500, 2,000, 3,000 and 4,000 meters. Wind directions through station circles can be shown by means of the usual arrow, with velocities jotted down beneath the arrow. Even as dumb a bird as you, Jim, then can tell about what to expect when he gets aloft—that is, you will be able to after a few hundred hours of flying, which ought to take off a few of the rough edges for you on meteorology. Anyway, here's hoping.



Above the crests of a dense Cumulus cloud which wipes out all traces of the terrain below.

AS I have been going over my notes in order to find a few points of interest, Jim, I've been wondering how in the Sam Hill you were planning to apply such a heterogeneous mess of data to some practical good later on. While I have endeavored to present meteorological facts in as logical a manner as possible, somehow it doesn't seem to make much sense as a layman might scan it.

Possibly that's due to the inherent difficulties in the "correspondence" method of instruction. However, I do want to say this to you, Jim, in all seriousness: Whatever help I may be able to give you on *facts* isn't worth a whoop unless you yourself correlate them and supplement them with additional facts and further study.

It is my humble opinion that no college student, and most high school students, for that matter, don't get very much out of a course unless they are so genuinely interested in the subject that they really want to do a lot of independent study and research. When they do that it gets just plain fascinating, for the more you learn about something the more you want to know about it, if you have a sincere yen to master that subject.

I realize you can't learn all there is to know about the weather out of books, and I'll agree with an old sea captain friend of mine that outguessing the weather on shipboard is half book-learning and half experience plus horse sense. But don't forget that the science of meteorology has been pretty carefully observed and set down on paper, and you've got to get that first of all before anything else.

I'll admit that every once in a while we have a major catastrophe which raises merry hades with everything we ever learned in books, but as long as the Almighty makes the rules I suppose He's got a right to break 'em now and then.

I'm taking this means of telling you, Jim, that plugging away at meteorology, while a tough proposition, is worth every best lick you can put into it. You never know when a good hard fact, safely stored away in your memory, is going to be mighty useful.

DURING my own research in this field, I found some interesting facts that show how the weather is distributed over the earth's surface. It does not happen to be exactly uniform, as you might suppose. For example, you might fly over every nook and corner of the U. S. A. and think you had seen every sort of weather that grew.

We've got mountains, rivers, plains, lakes—the biggest on earth, some of them. But the first few hours you were out over the ocean on a trans-Atlantic flight, Jim, you'd bump into more kinds of weather you never knew existed than you could shake a stick

at. And mean! Just plain ruinous to a pilot's disposition.

Take temperatures, fo example. Land areas produce the highest and the lowest. Why? Because water changes its temperature more slowly than any other known substance. That also explains why continents are warmer than oceans in the summer and colder in winter. Due to the prevalence of westerly winds and oceanic circulation, west coast points between the tropics and the polar regions are warmer in winter and colder in summer than east coast points.

The classic examples, to my way of thinking, are San Francisco and the British Isles. If you have been in Frisco in August you know what I mean. In England the Gulf Stream and westerly winds keep the winters much milder than you will find them in Labrador, although both places are in the same latitude.

Considering surface wind circulation on the globe, you'll find a lot of interesting facts. Light, variable winds surround the globe at the equator. This region, the doldrums, is likely to have heavy rainfall and frequent thunderstorms and squalls.

ABOVE and below the doldrums, come the trade winds, steady as a church and in the old days relied upon for getting a sailing vessel into port on time. Northern hemisphere trade winds are northeasterly, southern trade winds are southeasterly.

On the sides of the trades, toward the poles, are the so-called horse latitudes, marked by light winds, slight rainfall and scarcity of storms. In the temperate zones are found the winds we know as prevailing westerlies, also called the counter-trades.

Winds and weather in the temperate zones are very largely controlled by storms and low pressure areas traveling from west to east, called extra-tropical cyclones or lows. To the north of the prevailing westerlies we find winds having a northeasterly direction, although you must go quite a way north to encounter them. In the Antarctic regions a similar wind with a southeasterly direction is encountered.

Should your travels ever bring you over Asia, Jim, you will probably encounter the monsoon, a condition that brings heavy rains to India, Indo-China and the Islands off the coast of China. Over the Western Pacific this condition results in a south to southwesterly wind in the summer and a north or northwesterly wind in the winter.

If all this information about the distribution of the weather over the earth's surface hasn't lulled you to sleep, Jim, there is hope, as old Doc Munyon used to say. It's facts like these that you have got to salt away, dry as they may be, for some day you will find them mighty useful.

I've got to sign off now. Let's have word from you as soon as you have assimilated this data.

Yours, Charley.

## Doings of the Aero-Sportswomen

The flying-grandmothers visit the Goodyear Zeppelin Dock at Akron, Ohio.

WINGING their way into Akron, through a rainstorm which set them down in a forced landing at Mansfield, Ohio, two youthful looking flying-grandmothers stopped long enough to take up the cudgels for Herbert Hoover.

A few days later, in another forced landing in a field farther west, they cracked up their plane. Unhurt, and nothing daunted by the mishap they kept on with their speaking engagements until the plane was repaired.

Both Mrs. Samuel H. Dolbear and Mrs. H. Foster Bain of New York are the wives of mining engineers and good friends of the Hoovers. In fact, Mrs. Bain and her husband have followed Herbert Hoover to three different mining stations.

The plane in which they made their interesting campaign speaking tour, was an open cockpit Travelair which let in all the breezes of winter. Mrs. Bain, petite, slender, and bright-eyed confessing to fifty-three years of age, was the pilot. Mrs. Dolbear, in boyish looking tweeds, went along as passenger in the ship.

Mrs. Bain learned to fly at 51. She can't decide whether she got more of a thrill out of mastering a plane than she did out of her first donkey ride at the age of five, when she had saved her pennies for months in order to buy the donkey and begin traveling.

Sprinkled in between all these experiences are other still more thrilling things, for the life of this flying grandmother has been anything but prosaic at any time.

She followed her husband to Colorado in 1902, later to Alaska, then to Mexico and finally in war time to England. In England she worked in a picric acid factory and in the canteen, waiting table and washing dishes.

Later this indefatigable little woman followed her husband again to the Far East to Burma, to China and India. In India they located near the mine which Herbert Hoover had prospected, 800 miles north of Rangoon, and Mrs. Bain found herself one of seven white women in that part of the country. Siam, Malay, French Indo-China saw the Bains next.

After that, with a brief visit to Washington for orders in between, they were off again to Argentina in search of iron and oil. A trip to Bogota, Columbia, by air was Mrs. Bain's first cross-country flight. Later we find her riding army mules in Colombia with two Peon Indians along to do her cooking for her.

It was on her return from this colorful Argentine expedition that Mrs. Bain asked her husband to buy her a plane so that she might learn to fly herself. She enjoyed her first cross-country hop to Georgia last winter. When at home she does most of her flying from Newark Airport or from Westfield or Trenton, N. J.

As she left Akron airport on that cold breezy morning she called over her shoulder above the noise of the motors, "Am I heading in about the right direction for Cleveland? I always fly by compass, you see." And with a cheerful wave of one tiny gloved hand she was off.

"Meet you at the Miami air-meet," she added as an afterthought.

* * *

According to the latest Department of Commerce report, women flyers are becoming a very noticeable factor in respect to the number of private pilot licenses issued. There are so many women pilots, in fact, that they could make a very great success of this department if they would only write and tell us of their accomplishments.

* * *

Eleanor McKim is the first women to report take-offs from the snow with skiis attached to the running gear. This sort of take-off is an art in itself, and Miss McKim is to be congratulated.

* * *

Another French woman, Mlle. Elise Rue, now claims the world's altitude record for women. She claims 44,150 feet which is getting pretty close to the British men's record, but the skeptical F. A. I. is now carefully checking

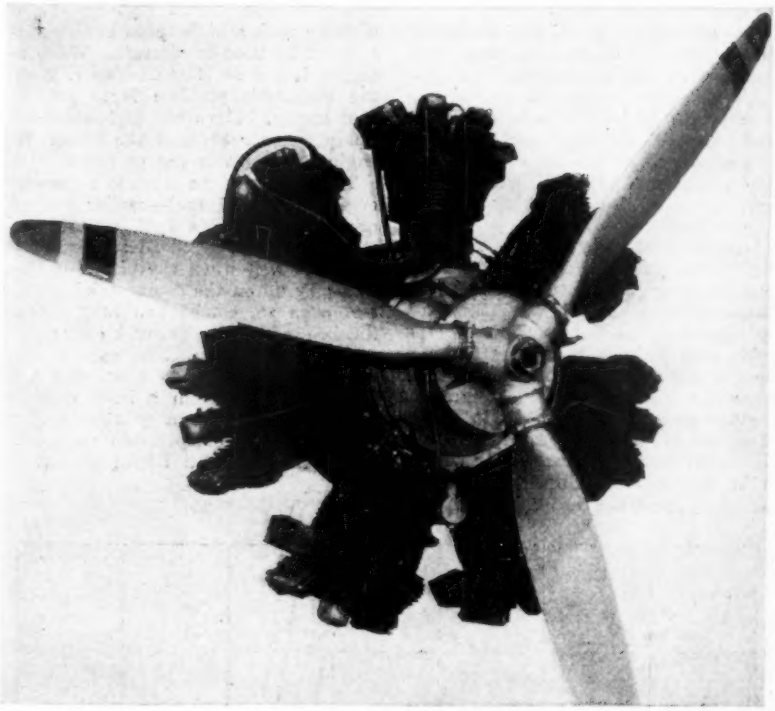
(*Continued on page* 66)

# Why the Diesel Engine Has Failed

*by*

C. W. CHURCHILL

*An Aeronautic engine expert questions the value of the Diesel engine.*



A typical Diesel aviation engine designed for running on heavy furnace oil which is in its experimental stage. Externally, at least, it looks much like a gasoline aviation engine.

IN RECENT years, the work of Dr. Junkers in Germany, of Louis Coalton of the Sunbeam Company in England and of Packard and Guiberson in America have aroused much optimism as to the future of the Diesel engine for aircraft use.

It is an established fact that these and other designers have produced aircraft Diesels of thoroughly practical design, of great reliability, of reasonably low weight which are simpler than gasoline engines, which do away with the ignition's interference with radio operation and which reduce danger of fire because the heavy oil used as fuel will not burn in the open air under normal conditions.

These advantages are so important that the aircraft Diesel would be of interest even without the further advantage that it uses fuel which costs from a fifth to a tenth as much as gasoline. It is this last advantage which looms largest in the minds of many engineers as well as most laymen, and yet this striking advantage may prove to be largely imaginary.

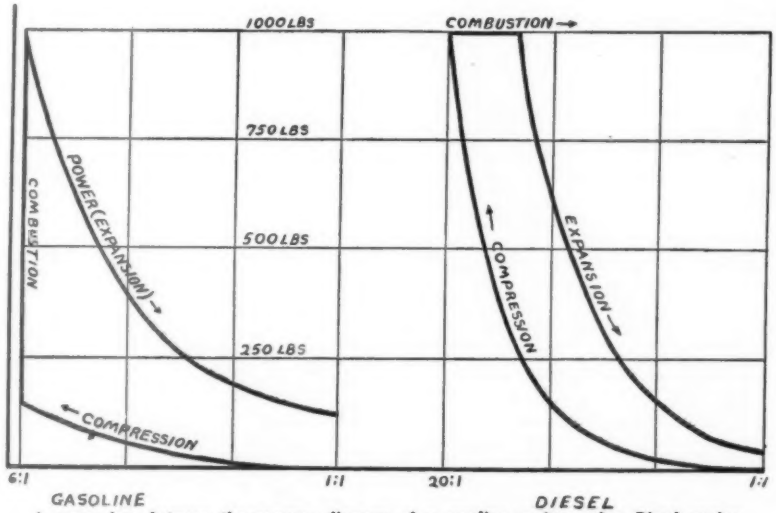
A good Diesel engine will burn nearly anything—fish oil, vegetable oil or even butter—but at present the only practical fuel is the heavy oil left as a by-product after petroleum has been exhausted for the last drop of gasoline. Gasoline is expensive because of the demand for it created by the twenty-some million automobiles in this country. Fuel oil is cheap because there is little demand for it.

But the actual cost, in terms of crude oil, is about the same for fuel oil as for gasoline. A barrel of crude oil can be converted into a high percentage of gasoline and a low percentage of fuel oil, or into a low percentage of gasoline and a high percentage of fuel oil, but the total will be about the same either way. To get more fuel oil, the refiner must cut down on the gasoline output.

Now, the fuel oil output of the refineries is very limited and little difficulty is found in marketing it for use in oil-burning furnaces and stationary Diesels. There is no real surplus of fuel oil piled up anywhere and there is no way of supplying any increased demand for it except by reducing the gasoline output. In normal times, crude oil is worth too much to turn into fuel oil if it can be converted into gasoline profitably.

Aircraft do not use a large proportion of the gasoline and fuel-oil output, but should an aircraft Diesel come into wide use, it is reasonable to think that Diesel engines would also be put into use in trucks and automobiles. And should that happen, or should the aircraft industry expand so that it would use an important percentage of our petroleum production, it would be found that refiners would be unable to supply the demand for fuel oil without restricting their gasoline output—a thing which they would refuse to do until the price of fuel oil rose to the price they could obtain for gasoline.

In other words, fuel oil is cheap only

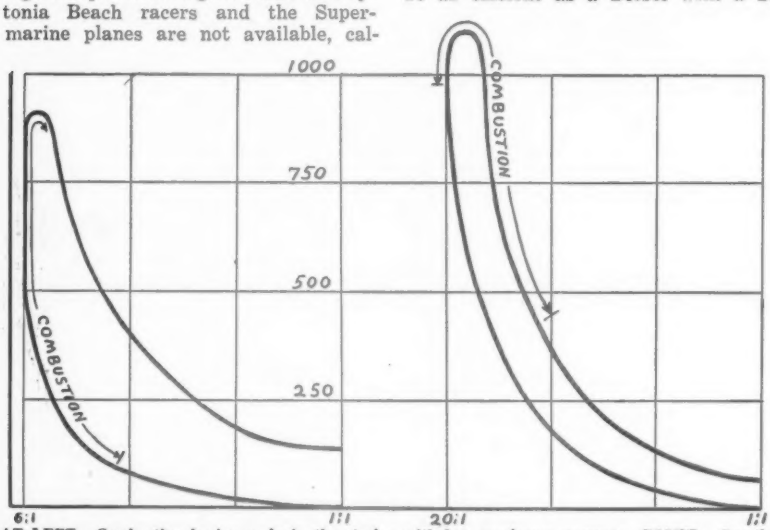



A comparison between the pressure diagram of a gasoline engine and a Diesel engine.

because it is an unavoidable by-product for which there is little demand. If the Diesel is ever perfected sufficiently to be put into wide use, fuel oil may cost just as much as gasoline, and the cheap fuel argument will vanish.

On the other hand, the Diesel is usually thought of as a more efficient engine than the conventional or Otto Cycle gasoline engine. A Diesel can be expected to be 45% efficient, while many gasoline engines are less than 25% efficient. If this were true at all times, the Diesel would still be cheaper to run, even with fuel costing as much as gasoline.

Unfortunately, for the progress of engine design, the efficiency of the gasoline engine is usually stated in terms of the automobile engine, which is needlessly inefficient because the public demands fast acceleration and smooth low-speed running rather than economy. Many standard aircraft engines show efficiencies up to 34 or 35%, and while actual figures on the high-compression engines used in Daytonia Beach racers and the Supermarine planes are not available, calculation indicates that the efficiency of such jobs can not be much below the 45% beyond which Diesels have not progressed for twenty years.




**AT LEFT. Combustion begins early in the stroke, with low maximum pressure. RIGHT. Greatly increased compression pressure, firing at end of stroke, greatly increases maximum pressure.**

Efficiency is simply a question of compression: the higher the compression, the higher the efficiency. A Diesel is efficient because it has to have a high compression to ignite the fuel. A gasoline engine of standard design is less efficient because engineers have found lower compressions more practical, not because compressions just as high as the Diesel compressions cannot be used if necessary.

In theory, and only in theory, the Diesel can use a higher compression because the fuel is not fired at the peak of the compression, but is burned slowly as the compression ratio falls. In theory, an ordinary gasoline engine with a compression ratio as high as a Diesel's would blow its head off because the fuel is fired at the peak of the compression, so that the maximum pressure would be ten or twelve times as high as that of a Diesel with the same compression ratio.

But in practice, no engine fires its fuel at the point theory indicates it will. No fuel burns fast enough to keep up with a high speed engine such as must be used in aircraft. When an engine is run at 1800 or 2000 r. p. m., the designer's problem is to get the fuel burned before the piston finishes the power stroke, and the faster the engine the greater the problem.

The answer is the same in a gasoline engine as in a Diesel—earlier ignition or injection of the fuel, as the case may be. A high-speed Diesel may start to inject fuel when the piston is only half-way up on the compression stroke and even so, combustion may not be finished when the exhaust opens.

A high-speed gasoline engine need not be fired quite so soon, and will finish its combustion a little quicker, so that in practice a gasoline engine with a 12 to 1 compression ratio may be as efficient as a Diesel with a 20 to 1 ratio. A 12 to 1 ratio has been used in at least one Daytonia Beach racer, and is thought to have been exceeded in some of the engines designed for recent racing planes.

In other words, a gasoline engine can be made as efficient as any Diesel, but designers have found that it is better to sacrifice a little efficiency in order to save a great deal of strain and weight. This leads to the conclusion that the high compression, upon which the operation of the Diesel depends, is a disadvantage, and that the Diesel, handicapped by the high compression which it must use, will never be as light or quite as free from excessive wear as a good gasoline engine.

The efficiency of the Diesel has not improved for years, while that of the gasoline engine has been rising steadily. Moreover, the efficiency of high-speed Diesels is poor, as Diesel prac-

(*Continued on page* 56)

## The Granath Variable Compression Gear.

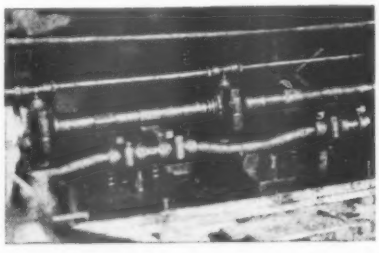
**View of the Granath Variable Compression Gear applied to a Ford engine.**

AFTER a number of experiments, covering a term of years, J. D. Granath, Chicago, has developed a simple yet effective device for varying the compression pressure and output of a gasoline engine.

The engine can be designed with a high compression ratio to obtain the maximum power output and efficiency of the engine at full load, and then by the use of the compression control device, the compression can be reduced to any desired point. This gives a wide power range that is under full control at all times.

As shown, the device is applied to a Ford engine in experimental form, and gives this engine a surprising performance in the way of power, speed and pick-up. It is eminently adapted for use with converted Ford airplane engines used on lightplanes, for it very greatly increases the available power of the engine.

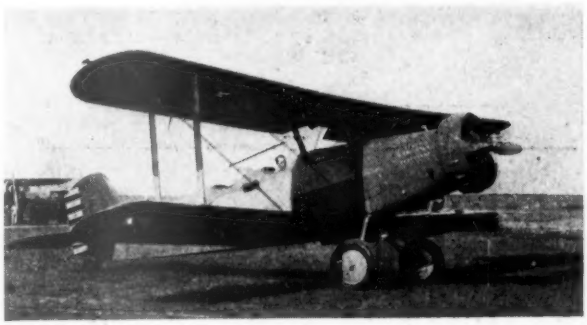
In brief, the control consists of a tapered tongue that slides in and out, under manual control, between the cams and the ends of the valve tappets. With this tapered tongue in various positions, it is evident that the lift of the inlet valves is also varied, thus regulating the amount of mixture going to the cylinders and the resulting compression pressure.



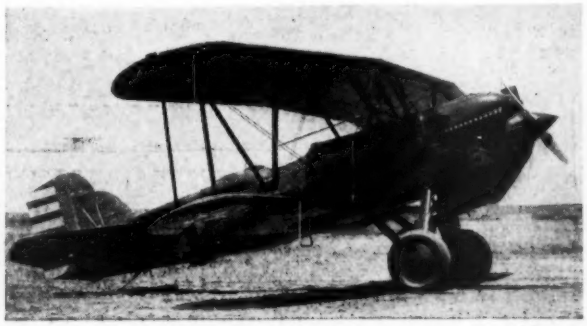
**The control shaft used for varying the compression of the engine.**

# Recent Army Photos for Your Album

These photos show eight well known U. S. Army Air Corps planes now in service, covering many different types and purposes. They were especially selected for the collection of our Photo Phans who wish pictures of recent types as well as the old wartime ships.



Douglas, type BT-2-B.



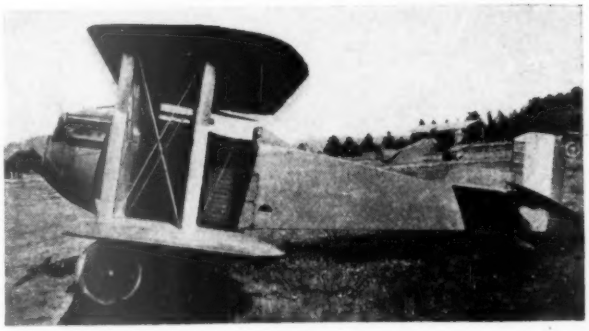
Curtiss "Falcon,," type A-3.

Douglas, type XO-31-a.

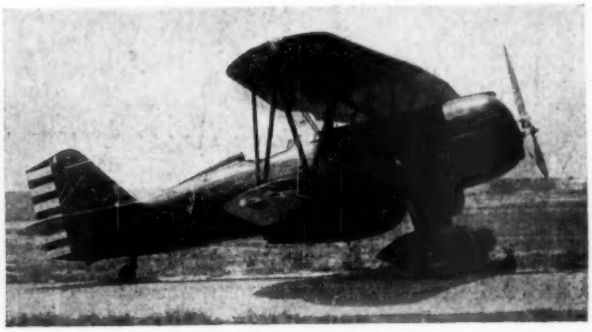
Curtiss "Falcon", type 0-39.

Thomas-Morse, type 0-19-c.

Curtiss "Hawk", type P-6-E.



Boeing, type MB-3a.



Curtiss "Hawk" modified.

XUM

## Elementary Features of Lightplane Design

By LESLIE LONG

A good example of lightplane design, the "Longster" designed by the author of this article. A trim looking ship.

ANY discussion of airplane design will sooner or later lead up to the old argument of Monoplane versus Biplane. This subject has been debated ever since flying began and it isn't settled yet. At present, however, it looks as though a place would be found for both with the monoplane definitely in the lead.

When dealing with true lightplane design, the problem is considerably altered. Here we have a case in which efficiency is the first and principal goal. In the larger and higher powered ships factors such as size, maneuverability and strength-weight ratios enter. In the true lightplane, we must have efficiency or we are not going to fly, and it is for this important reason that we are compelled to more or less rule out the light biplane.

No doubt many amateur builders will take exception to this for the biplane is popular. The spectacular performances seen in the past, nearly all of them by military and commercial biplanes, have led to this. However, there is no way to ignore facts. The best biplane you can build will never be more than 85% as efficient as an equivalent monoplane. In the very small plane it is rarely even that good. Not only that, but the majority of small biplanes have proven notoriously unstable. There have been many tiny monoplanes, both here and abroad, that have made a name for themselves when powered with from 20 to 30 horsepower, but there have been practically no biplanes that have been successful when powered with less than 40 H. P.

One of the first laws of flight is that high aspect ratio and high efficiency go together. An examination of the marvelous records of sailplanes proves this. The well deserved success of such lightplanes as the Aeronca is further proof. Once and for all, a high aspect ratio is vital to the lightplane. In every case of great weight being carried for a given horsepower you will find this is the case.

Aside from the fact that the biplane usually has the better aspect ratio, there is the factor of wing interference in biplanes. This always means a loss which we can't afford to allow in our lightplane with its limited power. Not only is there interference, but light biplanes are notoriously apt to be flat spinners, a serious handicap.

Let's make this plain by a little example. The well known Heath Parasol has a span of 25 feet. It flies well with a Henderson engine. Suppose we take the two wings and place them one above the other. This would make a biplane of twelve and one-half foot span. Such a ship would be absolutely worthless. If it did leave the ground it would have practically no aileron control and the gliding angle would be like that of a brick.

Much more could be said along these lines, but it would seem to be plain that for engines under 40 horsepower we should limit ourselves to the monoplane. Granting this, we find that we must decide upon which type of monoplane we shall build. There are four basic types, the low wing, midwing, cabin and parasol. The last three have all proven satisfactory, but the low wing in the lightplane class has never been a success. It has flying characteristics that are dangerous. When we consider the extra weight of the cabin type we are just about limited to the midwing and the parasol.

There are exceptions to every rule, but the amateur designer will be on the safest side if he keeps within the following rules of design: Ships of less than 35 horsepower should be monoplanes. Aspect ratios should lie between 6-1 and 10-1. Midwings and parasols are lightest and cheapest. The parasol has the greatest inherent stability of them all. Wire wing trussing such as used on the Aeronca and the modern military fighters is lighter, stronger and cheaper than strut bracing. The wing span of a successful ship will rarely be under 30 feet.

## A Plane Warns The Train

(See Cover)

SEVERAL times during the past few years, airplanes have been instrumental in saving railroad trains from collisions and derailment. And strange to say, most of these rescues have been made by pilot-instructors and students.

The pilot is in an excellent position to detect obstacles on the track, overlapped cars on sidings, crossed switch settings and the like. In fact, it would seem an excellent idea for the railroads to maintain an aerial right-of-way inspection system.

In the particular case illustrated by the cover, a student and his instructor were flying along the track when sudrenly, the instructor's keen eye noted a washed-out culvert. Had it not been for the quick wit of the pair, in flagging the overland limited as it emerged from the tunnel, there might have been a disastrous wreck.

## Automatic Aero Camera

A SMALL captive balloon affords a very convenient and reliable method of taking aerial views of landscapes, buildings, and other similar views.

The camera is suspended from the balloon as shown, with the lens pointing down. A spring attached to the shutter-trip snaps the picture when the shutter is released by a piece of burning punk, a fuse or similar device.

The shutter is pulled closed against the tension of the spring and is held in this position by tying the shutter trip to a short piece of fuse or punk. By experiment, it is a simple method to determine the time of burning, and the length of the fuse can be adjusted so that a given time will elapse when the balloon has ascended.

When at the proper height, the fuse releases the shutter, the picture is taken, and the balloon and camera are pulled down.

Here is the balloon and camera ready for an ascension.

# What Our Readers Are Building

A department devoted to our readers' activities in airplane, glider and engine construction, showing the latest developments in the amateur field.

## We Thank You

YOU should see the collection of amateur planes and gliders that we have on hand now! Everybody for a thousand miles around has kicked in with photos and specifications until we are in fine shape once more.

I tell you, fellows, it does our hearts good to see the ready response that you make when we offer up our call for help. Co-operation? Say—nothing else but from our loyal readers.

It is starting to look as though the country was well stocked with lightplanes, gliders, etc. We have published a bunch of planes, if you'll count back, and there is a big lot ahead of us that are still unpublished. Yes, the home-builder has been sticking to his job and has built and built and built. And here's looking at him—with both eyes.

## Builds Secondary Glider

This is the glider constructed by Ero Sihooven

WE SHOW a photo of the secondary glider built by Ero Sihooven, 607 Helmholz Ave., Waukegan, Ill. It was designed by Williams, assisted by the constructor, with the idea of ultimately installing a power plant in the ship.

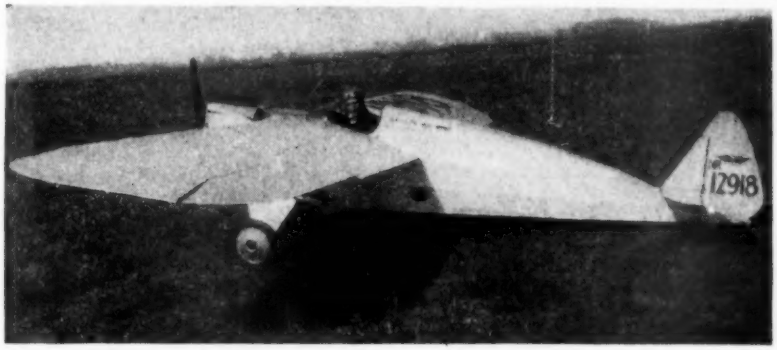
Up to date, the glider has reached an altitude of 400 feet, according to the builder, and it is provided with exceptionally effective controls that give it excellent flying qualities.

**Specifications**

| | |
|---|---|
| Wing Span | 32 ft., 8 in. |
| Wing chord | 5 ft., 0 in. |
| Aerofoil | Durand 24 |
| Incidence, at center | 2½° |
| Incidence, at tips | 0° |
| Overall length | 17 ft., 6 in. |
| Weight, empty | 190 lbs. |
| Flying speed | 30 m.p.h. |
| Landing speed | 18-20 m.p.h. |

Among the conveniences installed are an adjustable angle of incidence for the main wing, adjustable dihedral and adjustable stabilizer. The wings are braced with double wires which prevent twisting from taking place. The landing skids are of chrome molyb steel to resist wear, and the members are exceptionally rugged throughout as they have withstood pancake landings from 30 feet without suffering damage.

## Church Plane Reaches Altitude of 18,000 Feet




Charles Zajicek's Church lightplane which established a lightplane altitude record. 18,000 feet is a remarkable performance with a lightplane.

THE accompanying photographs show a Church lightplane built by Charles Zajicek, 1241 Scoville Ave., Berwyn, Ill. from the plans and materials supplied by the Church Airplane Company. He has not only built the ship but has taught himself to fly it.

He taught himself by making between 150 and 200 taxi runs down the field, penguin fashion, before taking it into the air for his first solo flight. It is quite likely that he saved the cost of the plane, and the Church engine with which it is equipped, out of the tuition fees that he would otherwise have been compelled to pay for the same amount of training.

And, even more remarkable, is the fact that this particular plane, under the observation of Delbert Koerner, Kankakee, Ill., made an unofficial altitude record of 18,000 feet when flown by Walter Franklin.

Not only has the ship performed splendidly at the local airport, but it has also defeated by several m.p.h. actual flying speed, all of the lightplanes in its class at Sky Harbor. Here it was also flown by Walter Franklin.

## And Now We Will See the Air-Camper

HERE is a snapshot of a Pietenpol Air-Camper built by Ralph Harmon and Leveritt Spellman, Greenwood, Ind. It made its initial flight on August 28, 1932.

Five days after its test flight, an inexperienced but ambitious lad tried to taxi her around the field while the owners were at lunch. The net result was a ground loop and a broken wing which is now being repaired.

The ship was tested with a Chevrolet engine, swinging a 6′ 0″ diameter, 3′ 6″ pitch propeller, but it was found that this engine did not develop sufficient power to hop two persons. They now intend to replace the Chevy engine with a Model "A" Ford as soon as possible. Thank you, fellows, she certainly looks like a fine ship.

After she gets patched up, hope you'll give us further dope.

Here we see the Harmon-Spellman edition of the Pietenpol "Air-Camper" which has had a varied career. Has she been test-hopped? Sure she has.

## The Fledglings Do Good Work

Here is a closeup view of the glider including a portrait of Mr. Smag.

THE Fledgling Glider Club, Grand Rapids, Mich., was organized after the purchase of a Leonard P. T. G. last spring. They have had over 100 flights without any crack-ups. They use the shock-cord method of launching which has served their purpose very well. We thank Mr. Leo Smag, 756 Douglas St., Grand Rapids Mich., who sent us this data and the accompanying photographs for our use.

Glider of the Fledgling Club in Flight.

## A Few Notes on Construction

THE best materials are none too good for the lightplane. It is poor economy to employ odds and ends or to employ "haywire" methods in building.

One of the greatest objections to the use of wood construction is the fact that wood construction gives the builder a wonderful opportunity for cheating himself. Instead of using the straight-grained spruce and ash that he should use, he will endanger the whole structure oftentimes by using white pine on the job. This is hardly possible with steel tubing, nor to the same extent.

Another point where the lightplane blacksmith will try to kid himself is in the use of bicycle wheels for his landing gear. We will admit that airplane wheels and tires cost a considerable amount of money, but they do not cost as much as a complete crack-up caused by buckled bicycle or baby-buggy wheels.

## Well, Here's A Hedgehopper With Us!

Here are the structural members of the Hedgehopper, with the engine and prop, but without the wings.

JACK C. HARKNESS, 35 Tryon Ave., West Englewood, N. J., got tired of standing about the airport sidelines and building models. He then became ambitious and decided to build his own plane, but when he found that there were so many restrictive laws in his state, he changed his mind—he built a penguin puddle-jumper instead.

Not satisfied with the plans laying around, he designed the puddle-jumper himself, somewhat on the same lines as those of the hedge-hopper described by Manley Mills in a recent issue of POPULAR AVIATION. The accompanying photographs show that he has made a neat job although he is contemplating certain improvements upon it.

He uses outrigger skids in the rear to keep the ship on an even keel until sufficient speed is attained to make the ailerons effective. He has worked on it for about a year, and says that with "shrewd buying," it can be built for about $100. It is built of spruce with plywood gussets and a midwing is to be fitted using wire bracing from the cabane and wheel struts. The engine will be lowered in order to lower the center of gravity which is now quite high for its type.

SPECIFICATIONS

| | |
|---|---|
| Wing span | 16 feet |
| Wing section | U. S. A.-5 |
| Wing chord | 3 feet |
| Length | 12 feet, 6 inches |
| Power: Harley Twin | 18 H. P. |
| Weight empty | 250 pounds |
| Estimated speed | 50 m.p.h. |

Mr. Harkness, to judge from the pictures, has obeyed the principal law of hedgehopper construction, that is, he has made the puddlejumper plenty strong and heavy, although there seems to be an unnecessary amount of complicated detail in the fuselage.

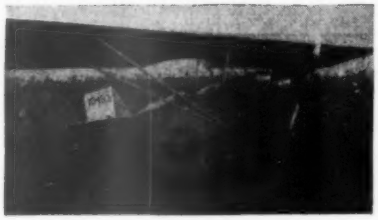
While the structure should be fairly light, of course, because we have a limited amount of power available, yet it can be made considerably heavier than the ordinary lightplane because it is not intended to fly. For the same reason, a much simpler construction can be employed.

Then again, the hedgehopper must be built with an idea of resisting "sideswipes", and it will meet with plenty of these. The Harkness machine seems plenty strong in this respect, but we do not favor the large diameter wheels which are usually rather weak in resisting side pressure. It is only necessary to use one wheel on this sort of a machine, and this wheel should be a good one.

We'll be glad to hear how she performs as soon as the various changes are made, and I am sure that many of our readers will be glad to know how to build this ship and thus get flight training at a very reasonable cost. Much obliged for your contribution.

A close-up of the front end showing the connections and other details of the hedgehopper.

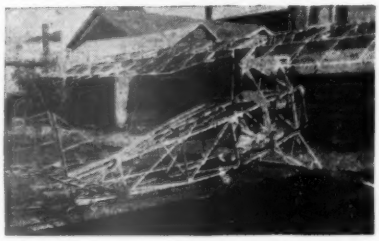
## The Kamm Parasol Plane is Neat



The Kamm job is a neat looking affair of the parasol type.

WE ARE pleased to describe a parasol lightplane that was built by John Kamm, 524 Twelfth St., Oshkosh, Wis. He says that the little ship, less the engine, cost under $100 and that it was test flown. The span in 26 feet with a length of 16 feet.

Mr. Kamm kindly offers to supply a limited number of plans for this ship for 25 cents, this being just sufficient to cover the cost of the blueprints and mailing charges. I know that our readers will be interested in this offer and we thank him as well.



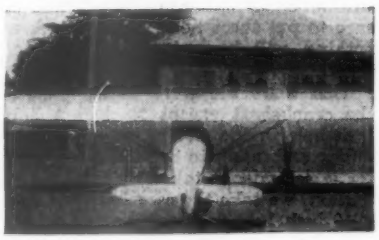
Here are the fuselage and wings before covering.

## And the State Laws Got Him

DURING his spare time, George Swede, 25 Terhune Ave., Lodi, N. Y., built the nifty little monoplane pictured here. About the time that he got it finished, the State of New York opened its justly celebrated anti-aircraft fire on amateur planes and this caught Mr. Swede in a mighty bad and unfortunate place.

Well, he didn't give up—he's not that kind—so he hied himself to an obscure cow pasture and tried her out. And did she fly? She did. However, in spite of his precautions, the John Laws of N. Y. got him, and now he's ready to sell or trade for a car.

So, while all equipped with a flyable lightplane, Mr. Swede is still walking.



George Swede built this one.

## BARTER AND EXCHANGE

Notices in this department will be inserted free of charge to our readers, but the publishers are not responsible for any difficulties arising out of the trades. Further, POPULAR AVIATION reserves the right to reject any advertisements that conflict with the policy of the magazine.

**LATE 1929 ESSEX** coupe, A-1 condition, to exchange for a Continental A-40 engine. Coupe has rumble seat, Lorraine spotlight and trunk.—A. P. Bogus, 4538 So. California Ave., Chicago, Ill.

**PLANS-INSTRUCTIONS** for building a Model "T" Ford-powered single-seater sport monoplane will be exchanged for a Briggs & Stratton or Smith motor-wheel engine, aeronautical books or what have you?—Manley Mills, Royston, Ga.

**PIETENPOL FUSELAGE** with seats, controls, tail group, streamline wires, landing gear vees and Pioneer tachometer to trade for a welded steel tube Heath Parasol fuselage. Must be in good condition and built from Heath blueprints.—Harry S. Hubbel, Dry Hill Road, Norwalk, Conn.

**FLYTEX AIRPLANE** fabric, odd lengths of ⅞ inch-20G.-No. 1025 steel tubing, other sizes also, Jones tachometer, and other odds and ends will be exchanged for model plans, materials or what have you?—Edward Whitley, 1001 Dorchester Ave., Dorchester, Mass.

**OLD TOWN BOAT** with J. R.-40 Johnson engine will be swapped for a seaplane in good condition.—Arch King, Longacre, W. Va.

**LATE MODEL** single cylinder motorcycle or a "Speedbike" bicycle engine wanted. Have much to trade. Write for Particulars. — Robert Becker, 4 Barnard Ave., Poughkeepsie, N. Y.

**1928 AMERICAN EAGLE** with OX-5 engine, A-1 shape, eligible for license (now identified), Millerized, D. H. Wheels, 35 hours since top-overhaul. Will trade for Bull-Pup, late model Heath or other reputable lightplane. Will deliver for cost of gas.—Sam Bakshas, Lewiston, Mont.

**LIGHTPLANE ENGINE** wanted, buy or trade. Wish a Henderson, Anzani, Szekley, Aeronca, Salmson or what have you?—Stanley LaMar, 97 Pearl St., Hagerstown, Ind.

**RADIO PARTS** or sets, and numerous other items will be exchanged for anything useful in connection with a lightplane. State what you want and what you will exchange for it.—Irville B. Kinsley, 802 16th. Street, Niagara Falls, N. Y.

**ENGLISH MAGAZINES** to exchange. I will exchange some of the latest copies of the English magazines, "Flight" and "The Aeroplane" for copies of POPULAR AVIATION from the first issue of P. A. to Nov. 1930 and May 1931.—Joe Axiso, Scta. S. Guiseppe, Themo, Malta, Europe.

**CURTISS ROBIN** monoplane with OX-5 engine to trade for a lightplane—preferably a biplane. The Robin is in Miami, Fla., and full particulars will be given to those who have a good lightplane to offer.—E. L. Moore, San Vincente, Porto Rico.

**FORD "T" STORMS** Flying Flivver. Has had only 4 hours, new tires, magneto, special Carter carbureter. Tail and rear of fuselage damaged. Will trade for a 2 or 3-place crackup in any condition. — W. R. Privette, Abita Springs, La.

**HALL-SCOTT ENGINE** and propeller (less hub), uncovered Heath wings, tail unit, half completed fuselage, landing gear (less wheels), Type 26 single cylinder Harley motorcycle, twin bullet lights, windshield. Will trade for anything that I can use. Write for details.—Victor Ring, Hastings, N. Dak.

**PAIR OF WINGS** suitable for hang-glider or hedge-hopper. Will trade for airplane materials, aeronautical books or what have you?—J. H. Griffy, Jr., 2700 West 11th. Street, Oklahoma City, Okla.

**BERLING MAGNETO**, 8 cylinder type. Will trade for a propeller suitable for a converted Ford "A" engine or a Lawrence "28" engine. War surplus material preferred.—Jess L. Jones, U. S. S. Idaho, Norfolk, Va.

**MODEL PLANS** (35). Will trade these plans for pictures of modern airplanes.—Fred Trebes, 2113 Wesley Ave., Berwyn, Ill.

**COMMERCIAL PLANE** photos to exchange for warplane pictures.—Paul Ecker, 3387 Superior Park Drive, Cleveland Heights, Ohio.

**AIRPLANE PICTURE** clippings. I have about 200 plane pictures clipped from aeronautical magazines. They are trimmed but not mounted. Will trade. Will buy photographs or literature describing the Dole flight to Honolulu.—Kenneth Duncan, 538 Broderick St., San Francisco, Calif.

**PICTURE** of a "Standard" and of a "Travel Air" to swap for a picture of Lindbergh's "Spirit of St. Louis". These pictures are taken with a camera.—James E. Alexander, Box 201, Topshany, Maine.

**PHOTOS** of Foreign military planes wanted. Will trade pictures and clippings for them.—Milton Macklis, 1621 St. Marks Ave., Brooklyn, N. Y.

**HEATH PARASOL**, test hopped. Will trade it for a Ford "A" convertible roadster or a licensed plane.—George Swede, 25 Terhune Ave., Lodi, N. Y.

**COMPLETE 40 TEXT** ground course in aviation to trade for a converted Henderson engine or a pair of 16x4 or 18x3 wheels and tires for one inch anxle. What have you?—C. J. Spencer, Kingston, Mich.

**HEATH-PARASOL** with Heath-Henderson engine, metal prop, 20x4 tires, etc. First class shape. Will trade for 1930 Ford Coupe or will trade in on two-place Aeronca, Eaglet, etc. Will also consider damaged ships in that class.—O. R. Aslakson, Cheyenne, N. Dak.

**LIGHTPLANE ENGINE** wanted, 30-40 h.p., in good condition. Will pay cash. State price.—Barnes, Box 113, Escalon, Calif.

**HUDSON COACH.** Will trade for light plane, motor, equipment or a steel lathe.—Dick McKenzie, 11 S. Ringold St., Janesville, Wis.

**AVIATION BOOKS** and correspondence courses wanted. Will trade a brand new 40 inch woodturing lathe, 1928 Yancey's Aerial Navigation and Meteorology or cash if low enough. Would also like to hear from other high school aviation clubs.—Mechanics Arts Sky Club, 2298 Pricilla St., St. Paul, Minn.

**TRACTOR PLOW**, 3 aeronautical books, aviation course, glider, motorcycle and radio. Will swap for lightplane in any condition.—Ed. D. Tracht, R. D. 3, Galion, Ohio.

**PHOTOGRAPHS.** I have over 200 aerial photographs of N. Y. C., including different airports, military planes in formation, different types of military planes on ground. The photos are all 8x10 inches. Want to trade?—Joe Baltrio, 435 Ashford St., Brooklyn, N. Y.

**CONVERTED GAS ENGINE** wanted, weighing about 15 pounds. To be used for scooter or hedgehopper. Will pay cash. Quote prices.—David Beach, 529 E. 3rd Ave., Roselle, N. J.

**WORLD WAR PHOTOS** wanted. Quote prices.—Onis Richardson, P. O. Box 323, Lozo Oil and Transport Co., Aruba, D. W. I.

**WILL SWAP** lists of photos or any kind of aeronautical pictures. Have pictures dating back to 1909, early ships, old time pilots (before 1922) and others. I also have a few well made propeller clocks. Write.—Ferdinand Winzen, 34-11 32nd St., Astoria, L. I.

**PICTURES WANTED.** Any kind, photos or clippings, clean and of nice size, at a fair price. Would like to enlarge my collection of A. L. William's racer, the "Mercury" and other early (1923) racers. Interested in all types of the Curtiss "Falcon" and XNZC-1. Would like to get in contact with fellows that have them.—Bernard Ederr, 1320 N. Bentalow St., Baltimore, Md.

**PHOTOS SWAPPED.** We want to get in touch with aviation photo collectors or fellows starting collections. Write us.—A. A. Askew, Jr., Box 72, Barrytown, N. Y., or Maurice Commanday, 18 Ridge Road, Yonkers, N. Y.

XUM

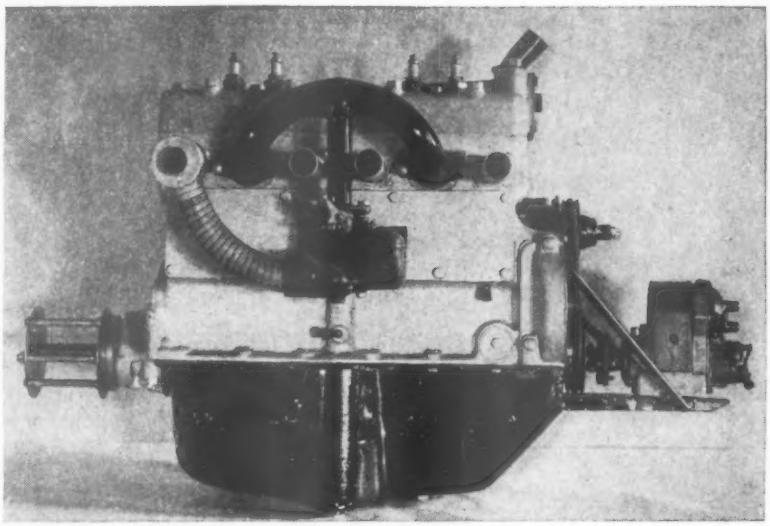
# Converting Ford Model "A" Engines

*by*

B. H. PIETENPOL

PART II.

Lightplane expert specializing on Ford conversions and Ford powered planes. The data set forth here represents years of experimental work.



Carburetor side of the converted Ford "A" engine showing the air-warmer and the intake manifold in place. Note the simplicity of the power-plant.

FORD engines, after a few alterations, have proved highly successful for the propulsion of lightplanes, and as pointed out in the December issue of POPULAR AVIATION, the necessary alterations for the Ford Model "A" engine can be made at a comparatively small expense and with little labor.

I have been using Ford engines for a long time, and can assure you that the modified engine is quite successful and capable of long service if a few precautions are observed in making the conversion and in handling the engine carefully in flight.

As I told you in the first part of this series, there are three parts of the engine that must be altered under all conditions. The lubricating system must be changed, the cooling system must be improved and the ignition should be revised from the battery system used in the car to the high-tension magneto that is employed for most aeronautic engines.

First of all, we must always remember that the engine works much harder under a much heavier load in an airplane than when it is propelling the car over a road. This in turn means that more heat is developed in the cylinders and therefore that more heat must be removed by the water circulating system.

Second, the bearings are more heavily loaded and more lubricating oil under a pressure must be forced to the bearings to remove the heat developed by friction in the bearings. The oil must be forced into every part under pressure and not simply allowed to flow into place under gravity. Third, the battery system is too heavy and cumbersome to use in the lightplane, and therefore the small high-tension magneto must be substituted for the battery system used with the engine in the car on the road.

While the original carburetor supplied with the Ford Model "A" engine will give good service, yet the newer Model "B" carburetor is far better and safer. It gives a better mixture than the old carburetor and does not leak gasoline when going over rough ground or when on a steep glide.

To begin with, we will first take the crankshaft and cut off 5/8 inch on the pulley end. This is done so that the shaft will be short and light and so that the magneto, driven from the end of the shaft, will be as close to the engine as possible.

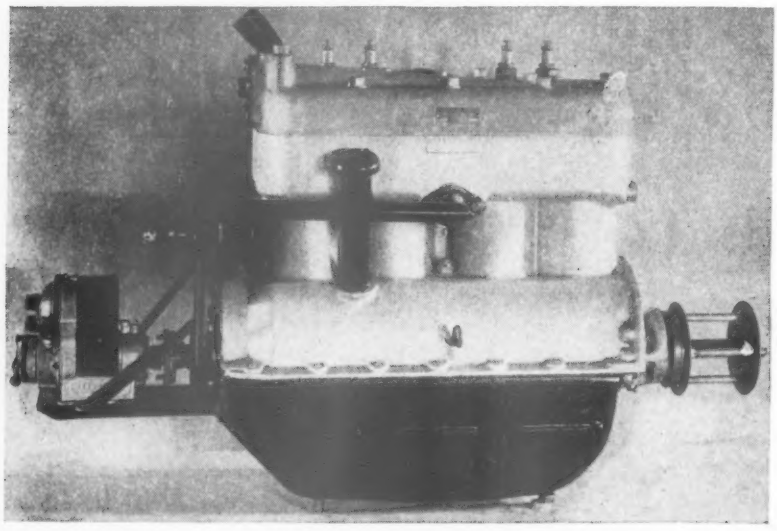
Now take a piece of 3/4 inch or 7/8 inch shafting, the size of the shaft depending upon the size of the magneto coupling, and turn it down on one end. Now cut threads on the end of the shaft with a lathe so that the threads are a tight fit. The threads must be tight in the crankshaft so that the part will not work loose.

Now put it into the lathe and true up the short shaft to fit the magneto coupling, taking off 1/8 inch from the outside of the small timing gear. This must be done so that the sheet steel timing gear cover will not rub on the gear as it would do if this work were not done. Now, drill a small hole in the timing gear marks, 3/16 inch deep, befor turning down the face so that you will have the timing marks left, and be sure to put these holes on the mark as nothing will be gained by changing them.

This is all the work to be done on the crankshaft except to drill a 3/16 inch hole in the end to hold the pump pulley and magneto drive shaft, a matter which will be taken up later on.

Next, we take the camshaft and drill a 3/8 inch hole in the gear end of the

(*Continued on page* 38)



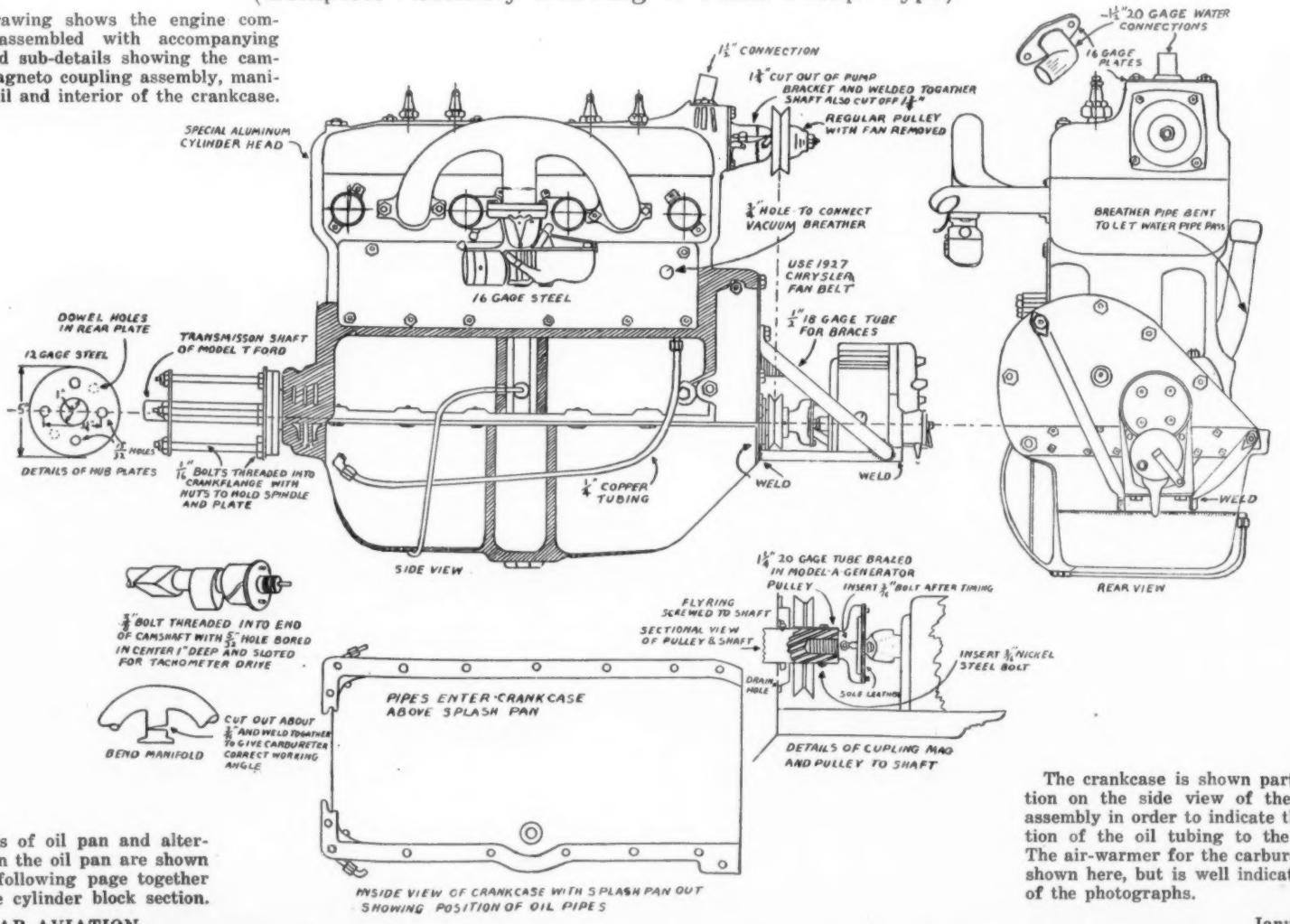
Reverse side of the engine showing the "low" type of water circulating pump and the magneto.

XUM

# Pietenpol Converted Ford Model "A" Engine

## (Complete Assembly Drawing of Head Pump Type)

This drawing shows the engine completely assembled with accompanying assembled sub-details showing the camshaft, magneto coupling assembly, manifold detail and interior of the crankcase.

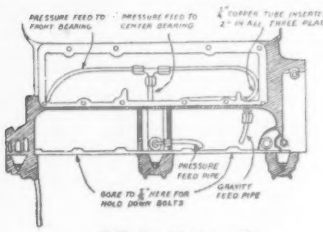

1½" CONNECTION
1¼" CUT OUT OF PUMP BRACKET AND WELDED TOGATHER SHAFT ALSO CUT OFF 1¼"
REGULAR PULLEY WITH FAN REMOVED
SPECIAL ALUMINUM CYLINDER HEAD
¾" HOLE TO CONNECT VACUUM BREATHER
USE 1927 CHRYSLER FAN BELT
16 GAGE STEEL
½" 18 GAGE TUBE FOR BRACES
DOWEL HOLES IN REAR PLATE
12 GAGE STEEL
TRANSMISSON SHAFT OF MODEL T FORD
DETAILS OF HUB PLATES
⅛" BOLTS THREADED INTO CRANKFLANGE WITH NUTS TO HOLD SPINDLE AND PLATE
¼" COPPER TUBING
WELD
WELD
SIDE VIEW
1½"-20 GAGE WATER CONNECTIONS
16 GAGE PLATES
BREATHER PIPE BENT TO LET WATER PIPE PASS
WELD
REAR VIEW
⅜" BOLT THREADED INTO END OF CAMSHAFT WITH ⅜" HOLE BORED IN CENTER 1" DEEP AND SLOTED FOR TACHOMETER DRIVE
BEND MANIFOLD
CUT OUT ABOUT ⅜" AND WELD TOGATHER TO GIVE CARBURETER CORRECT WORKING ANGLE
PIPES ENTER CRANKCASE ABOVE SPLASH PAN
INSIDE VIEW OF CRANKCASE WITH SPLASH PAN OUT SHOWING POSITION OF OIL PIPES
1½" 20 GAGE TUBE BRAZED IN MODEL A GENERATOR PULLEY
INSERT ¾" BOLT AFTER TIMING
FLYRING SCREWED TO SHAFT
SECTIONAL VIEW OF PULLEY & SHAFT
INSERT ¾" NICKEL STEEL BOLT
DRAIN HOLE
SOLE LEATHER
DETAILS OF CUPLING MAG AND PULLEY TO SHAFT

Details of oil pan and alterations on the oil pan are shown on the following page together with the cylinder block section.

The crankcase is shown partly in section on the side view of the complete assembly in order to indicate the connection of the oil tubing to the bearings. The air-warmer for the carbureter is not shown here, but is well indicated by one of the photographs.

## Ford Engine

(*Continued from page 36*)


PRESSURE FEED TO FRONT BEARING
PRESSURE FEED TO CENTER BEARING
PRESSURE FEED PIPE
GRAVITY FEED PIPE
BORE TO HERE FOR HOLD DOWN BOLTS

**Cylinder block section.**

camshaft, afterwards tapping it with a thread, and then screw in a ⅜ inch bolt which should be a tight fit.

Next, cut off the bolt so that it is about one inch long. This is for the tachometer drive, and as the end of the camshaft is soft, this operation will give you no trouble. Now drill a 5/32 inch hole lengthwise through the bolt and cut a slot on one side to take the key on the tachometer shaft. All of the above work is done with the camshaft in the lathe. Before removing it, turn off ⅛ inch from this gear to match the small gear. The camshaft is now complete and ready.

Next come the alterations on the crankcase. This will prove the longest job on the whole engine, but there is nothing particularly difficult about it if you take it slowly and carefully. The first move is to take the drip tray from the pan and bolt the crankcase to the block with all the bolts. There is to be nothing on the block except the crankshaft—bolted in tight. It need not turn, in fact, it is best if it does not turn. Be sure to put gaskets under the pan before bolting it on.

Next, take a hacksaw and saw off the end of the crankcase flush with the timing gear case, but be careful not to cut it too short. Better saw it a little too long and then finish it with a file.

We are now ready to make the timing gear cover, which is made of No. 16 gauge flat steel and it is always a little safer to make a pattern for this part out of cardboard before cutting into the steel, first taking the shape or outline from the old cover. However, if you are making this for anything else than the 1928 model, it will be necessary to cut it on the marks shown by the plans. On a 1928 engine it is all in one piece.

Bolt this cover in place with all of the bolts, being sure that the crankshaft goes through the center of the hole. No gaskets are used under the cover at this time, and with this work done you are now ready to weld it to the waiting crankcase.

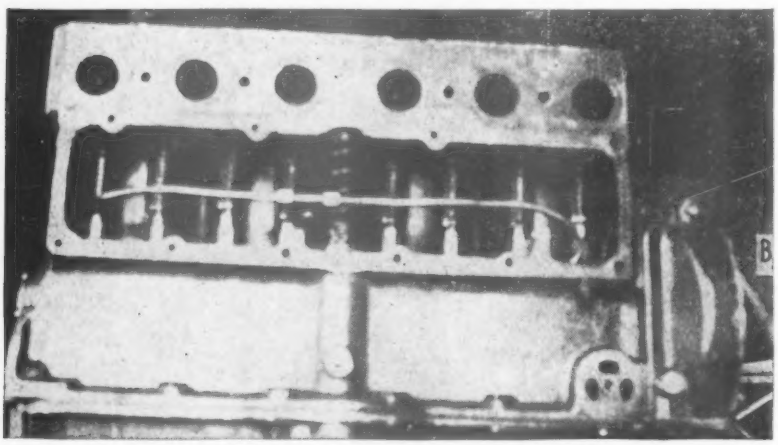
When welding, do not have the large gear in the crankcase at the time, for the welding heat will spoil the gear. One time I forgot to take out the gear, and the net result was that I had to buy a new gear. Weld, leaving the crankcase and timing gear cover bolted in place. Do not remove until you have the magneto bracket completely welded on and the job is finished.

The shelf for the magneto is made out of a piece of No. 14 gauge steel, 3½ inches wide by 9 inches long. The sides of the channel are made of ⅝ inch, 13 gauge strip steel welded on.

In my experience, I have seen many converted Fords give trouble because the magneto shafts were not properly lined up and I believe that you should take more than ordinary care with the alignment of the magneto shafts because this job is very important. When the magneto stands on the bracket, the shaft must be in line with the engine shaft or the magneto bearings will soon be destroyed by the heavy load placed on them by variations in the poorly lined shaft.

Get an old magneto (a DU4 Bosch preferred), a magneto that is no good for any other purpose, and then take this magneto all apart. You will only need the ends and the monel body of the magneto.

Now, take a piece of 1 3/16 inch steel tubing (inside diameter) that is to be a tight fit over the end of the crankshaft. Turn out the bearings in the magneto ends so that they will be a tight fit over the steel tube. You will



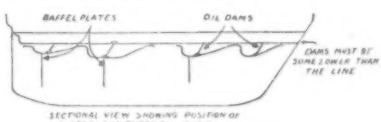
**Side elevation of cylinder block with valve chamber cover removed, showing oil tubing installed.**

**End view of assembled engine showing magneto.**

now see that if you fasten the magneto shelf to this jig and slip the whole thing on the crankshaft, while you weld the crankcase, that it will have to be completely in line.

After this job is done, make the two magneto braces of ½ inch 18 gauge

**Plan of oil pan.**




**Section through oil pan.**

steel. Make the top connection to the engine first, bolt it on, and then weld it to the magneto shelf. You will also notice that if you use the side type water-pump that the right hand brace goes one bolt higher than when the regular pump is used.

You will see that it is necessary to remove the magneto for both types of pumps, and the magneto and crankcase on the side type pump to replace the belt, but as the belt will last for years, this does not matter.

The reason for telling you all this is that I saw one fellow cut the belt to get it on, and a spliced belt is very likely to break in service. He did not discover that the belt would not go on last and he could not take the magneto off so that he could slip the belt in place. I wish to say that the belt for the regular pump is the 1925 Chrysler belt, and the proper belt for the side-type pump is a regular 1917 to 1925 Hupmobile belt.

(*Continued on page 56*)

# New Ideas for Our Model Builders

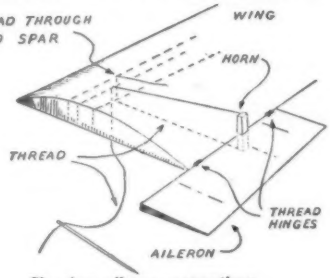
New Model building stunts of interest, gathered from far and near for our readers.

## Here's a Hint for Modelists

Here's Plaxton's display.

AND here we have a model builder who makes his models pay for themselves. Gordon Plaxton, 15736 La-Salle Ave., Detroit, Mich., sells certain of his models to pay for the materials used in the succeeding models. Not a bad idea at all. The accompanying photo shows one of his line-ups which shows that our Detroit friend goes into the thing quite energetically.

## Aileron Control of Models




Showing aileron connections.

AILERON flaps can be used to good advantage on models for adjusting the balance in flight. If the model is unbalanced laterally (side to side), lowering one aileron and raising the other will correct this unbalance, providing that the rudder is also readjusted. The ailerons can be made to correct unbalance due to the warping or the loss of alignment that comes when the model is used roughly.

The ailerons are also used to improve fore-and-aft balance. For example, if the model is tail-heavy, *lower both ailerons* and they will hold the nose down. If the model is nose-heavy, raise the ailerons and they will hold the nose up. These suggestions were made by Fred Haid, Santa Fe, N. M., who also states that threads run through the spars will keep the ailerons in place when adjusted.

This should be a suggestion on the making of a tailless model where the control is entirely by aileron flaps.

## LAST CALL FOR P. A. MODEL CONTEST

THIS is the last call for the POPULAR AVIATION International Model Airplane Contest, for when this issue reaches you, we will be pretty well on to the closing date of the contest—December 31.

Entries have been coming in fine, with the one exception of entries in the Original Design Section, No. 4. There don't seem to be many model builders working along original ideas, not so many as we would like to see. We always have had the idea that some of our readers could cook up something that was out of the usual line of model building, but the number that have reported so far are lamentably few.

However, what we lack in one department we more than make up in the others, and we certainly have a big collection of flying scale models of all kinds, varieties and sizes. There is a wide diversity of types, of course, but the Gee-Bee and the various Lockheed ships seem to be prime favorites.

Now, here is where we answer a question that seems to be troubling many of the builders. Many have asked us, "is it necessary to take the picture of a flying model while it is flying?" And the answer is—"no." Take it standing still, for we can get a better idea of what it looks like in this way than when it is flying.

Then, second in number to the above question, are those who wish to know whether they shall leave the rubber in the model when it is sent to us. This also calls for the answer—"no"—for we do not intend to fly the models. Just fix the propeller so that it will stay in place when the rubber is removed—that is all.

And now to review the contest for the benefit of new readers who have not read the instructions in previous issues of POPULAR AVIATION. First, you build your model and take a good clear photograph of it. Second, you send photograph in to us after pasting the attached coupon on the back of the photograph or writing the same information on the back of the photograph. It is not necessary to use the coupon but we must have the information indicated on the coupon.

But don't send the model, itself. After we look over the photographs, we will send for the models that we wish to examine more closely, and then pack it up carefully and send it in.

And just remember, there are 81 beautiful prizes to be given for the best 81 models—prizes that you would be glad to own. There are silver colonnades, cups, medals, free subscriptions and everything. But you must hurry!

And still we find that the entries in the flying-stick and original design sections are relatively few in number and we again call your attention to opportunities in this division.

We suggest that contestants who have already entered a scale model, turn about and hurry in a stick or freak model in addition. This will not take much time and it may bring you up into the limelight.

### How to Enter the Model Contest

1. Take one or more good photographs of your model or models.
2. Fill out the coupon, or a facsmile of same, giving name, address and classification under which you wish the model to be entered.
3. Paste a coupon, or facsmile, or write out the information on the back of each photograph and send them to POPULAR AVIATION, Model Contest, 608 S. Dearborn St., Chicago, Ill.
4. Please do not send a letter with the photos, nor ask us questions as to the progress of the contest. All such information will be found in preceding issues of POPULAR AVIATION.
5. THIS CONTEST CLOSES DECEMBER 31, 1932.
6. As soon after Dec. 31, 1932, as possible, the 81 winning contestants will be asked to ship their finished model to Chicago where a group of expert judges will decide prize winers by a personal examination of the actual models.

The following information must appear complete on the back of every model photograph submitted in this contest. This entry blank is printed for your convenience to paste on the back of photographs, but is not required so long as the information is filled out on the back of each photograph.

POPULAR AVIATION FIRST INTERNATIONAL
**MODEL AIRPLANE CONTEST**
**608 South Dearborn St. Chicago, Ill.**

Please enter this photograph in the division checked:
Flying ☐ Non-Flying ☐ Stick ☐ Freak Design ☐

Name .....

Street or R. F. D. .....

City ..... State .....

# A Scale Miniature of the Fairchild "24"

*by* FRANK J. WRIGHT

Build this ornamental scale replica. It deserves a place in your library or living room.

AS ALL the parts are cemented to the body or to a part of it, this unit should be completely cut and formed to shape first. The general shape of the body through the cross section is oblong. The corners are slightly rounded. Any part of the body may be checked on the plan view and at the same point on the side view which will give the correct width and height.

The depth of the cabin reaches to the very bottom of the fuselage on the big plane. In the small solid model, a thickness of approximately one-quarter inch is left remaining on the bottom side which holds the front and rear parts together.

The cockpit may be cut out by chiselling to the proper depth or the sides may be removed by cutting that part away and replacing the sides with a thin piece of one-sixteenth inch balsa.

The propeller is attached to the uppermost part of the nose which is left a trifle flat for this purpose. The tail wheel is held in place by a small bent wire fitting pushed into the body and cemented securely.

The rudder and stabilizer are built complete and inserted into cutout sections of the body at the rear. The stabilizer and rudder may be so constructed that both may be removed or put in place at will. It is best to paint these units separately allowing them to throughly dry before putting them on the body permanently or simply placing them in the cut-out sections.

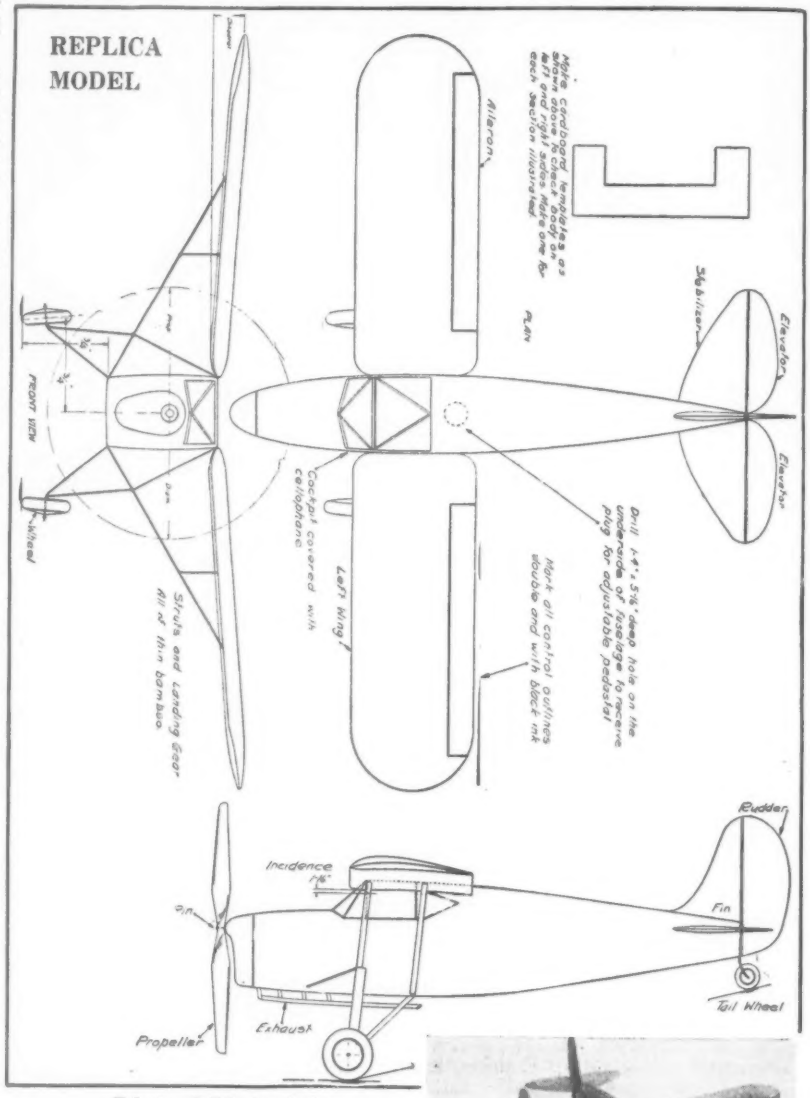
The landing gear and the wing struts are all made of small bamboo parts. Where these bamboo sections attach to the body they should be forced into it for a small distance and then attached firmly in place by cementing. At the point where the wings meet at the top of the cabin, the small bamboo section is inserted into each wing approximately one quarter of an inch. The cabin windows are small sections of cellophane.

The bamboo part, which is used as the front inside strut on the landing gear, continues and becomes a part of the axle. This section which extends beyond the upright landing gear strut, is then rounded and holds the wheel. The exhaust under the body is made of small pieces of balsa.

The wings are built left and right, cut to the proper outline shown on the plan view and then streamlined to the wing section. The wings should be painted before attaching to the body. The wings and tail parts are orange, the body is blue, all the struts and the braces in the cabin are black, including the wheels.

The propeller is mounted on a small bushing which is held in place by a pin. Before applying lacquer all balsa parts should be given two or three coats of dope.

The photograph illustrates the model mounted on a pedestal which gives it a completely finished appearance. This pedestal is made up of four units: the base to which is attached a small piece of felt, the column at the top of which is a small hole which receives a short plug with a head similar to that of a clothes pin. This plug is cemented into the body and the head sets into the top hole of the column and in this way the model can be moved about in various positions as if in flight.




## List of Materials

| | | | | |
|---|---|---|---|---|
| No. 1 | Body | 7/8" | x 1 1/4" x 5 1/2" | 1 |
| No. 2 | Wings | 3-16" | x 1 3/4" x 33 3/4" | 2 |
| No. 3 | Stabilizer | 1-16" | x 1 1/4" x 3" | 1 |
| No. 4 | Rudder | 1-16" | x 1 1/2" x 1 1/2" | 1 |
| No. 5 | Wing Struts | | Bamboo | 1 |
| No. 6 | Landing Gear | | Bamboo | 1 |
| No. 7 | Wheels | 1/2" | diameter | 2 |
| No. 8 | Tail Wheel | 3-16" | diameter | 1 |
| No. 9 | Propeller | 2 1/2" | diameter | 1 |
| No. 10 | Propeller Hub | 1-16" | x 3-16" | 1 |
| No. 11 | Windshield | 1 1/2" | x 2" | 1 |
| No. 12 | Tail Wheel Wire | .016" | x 1" | 1 |
| No. 13 | Cement | | Clear | 1 |
| No. 14 | Dope | | Clear | 1 |
| No. 15 | Blue lacquer | | Vial | 1 |
| No. 16 | Orange lacquer | | Vial | 1 |
| No. 17 | Black lacquer | | Vial | 1 |
| No. 18 | Optional-Pedestal | | | 1 |

The completed miniature on pedestal.

## What A Model Builder Should Know

IT DOES seem strange that when many of the model airplane builders begin to build model airplanes for the first time they get started on the wrong path. As a rule, beginners who get enthused over model airplanes build a scale model of some large airplane first and then expect it to fly longer than a simple stick model.

The result of many of these expectations is not successful and all enthusiasm, work and dreams of flying go to nought. The builders are disgusted with model aviation and wrongfully scorn this wonderful science. You model builders who have designed, built and flown models successfully, and have been in the game for a number of years, know that building a scale model for a first model is entirely the wrong thing to do.

If a model builder wants to have a successful take-off and happy landings in this very fascinating, educational work of model aeronautics, I would like to give you a few words of advice that will preserve your enthusiasm and your dreams of those long duration flights. My advice will prevent your first model flight from stalling and nose diving into the ground, which with most beginners, causes grand crack-ups and ends in disaster.

First. Begin with the simplest type of model airplane—I recommend the indoor baby R. O. G. This type of model is very simple in design and has very few parts; flies very well, and can be purchased from reliable model manufacturers at a very small cost. Do not try to design your baby R. O. G., but follow the drawing and instructions of a purchased kit faithfully and build accordingly. When through building, you are ready to fly the model and from what you have learned from the building and flying of this simple model you will have established the principles of flight as applied to heavier than air machines of all types.

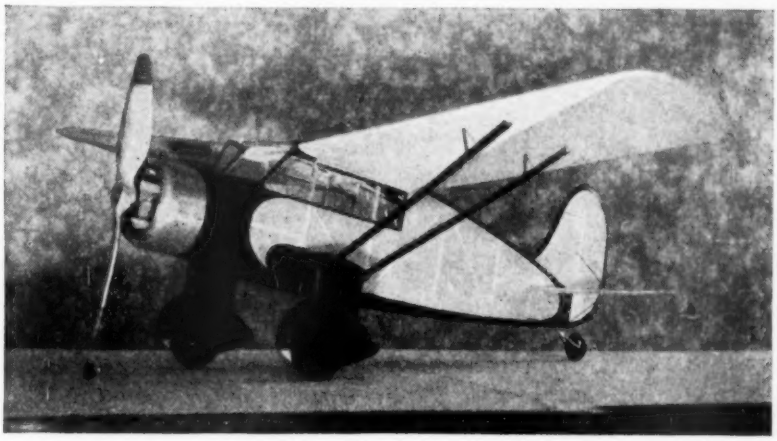
Also you will be encouraged to build more models of the stick type first, as practice with these types will improve your workmanship and flying as well as teaching model aerodynamics necessary in flying a scale model. Creep before you walk by building and flying a baby R. O. G. first, then build and fly other stick types before building and flying scale models.

In building your first model, try to do your work neatly and do not rush your work. Neatness and speed will be acquired as you go along in the building of models. Poor workmanship does not aid strength and flying quality to your model. By rushing your model to get it done, you are liable to overlook a few minor points.

Be sure you have good tools. The tools required to build model airplanes are few and simple. They consist of

(*Continued on page* 50)

## A Well Built Stinson Model "R" Flying Model



**Here it stands, a flying scale model that flies successfully at the high altitudes of Wyoming. It is equipped with automatic controls that assist landing.**

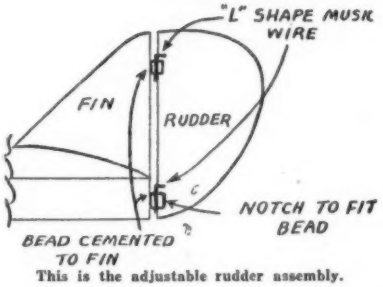
SOME scale models look well but don't do much flying. Some fly but are not much for looks. But here is a scale model of the Stinson Type R that has both beauty and excellent flying qualities.

It was built by Mr. C. L. Bristol, Cheyenne, Wyo., who, to judge from the photograph, is out of the Junior Grade by several years. He, and Mr. Harris whose model appeared in the last issue, are two of our business men who delight in this hobby of model building. May there be more of them.

Mr. Bristol states, that this model has a span of 30 inches and weighs 2.4 ounces. It flies well, makes good landings, due to a combination of shock-absorbers and an automatic stabilizer control that utilizes the motor rubber tension to adjust the angle of the stabilizer.

Out in Cheyenne, where Mr. Bristol lives, the models fly with alarming speed because of the high altitude. He says that all the modelists in his locality are living near the "stratosphere" and are having their troubles.

## An Adjustable Rudder for Models




**This is the adjustable rudder assembly.**

ROYAL BARSKI, 811 Walker Street, Dickson, Pa., sends in a useful suggestion for an adjustable rudder that will assist the flying of models in straight or curved paths.

Two "L" shaped pieces of music wire are bent. One part of the wire is inserted into the bead while the other part is pressed into the rudder, cement being applied to hold this end of the wire to the rudder.

A notch is then made in the rudder so that it will fit half of the bead, thus reducing the open space between the rudder and the fin. The bead is now cemented to the fin.

There is no doubt but that an adjustable rudder adds considerably to the pleasure of flying models, and this addition is well worth trying.

## Welcome To Our City

WELL, one of our lost sheep has turned up at last. This is Frank Bennett, 207 West Troy St., Dothan, Ala., who contributed the hand-drill winder shown in the December issue. Mr. Bennett, you will remember, failed to sign his name on his contribution, so we take this opportunity of telling you who he is.

## To Hold Preliminary Contest

MR. H. H. HICK, of the Sturdy Built Model Works, Portland, Ore., will sponsor a model contest on November 27, which will serve as a preliminary to the Popular Aviation International Model Contest.

All of the winners in this preliminary contest will be photographed and the photos will be submitted to POPULAR AVIATION. We believe that this will be a mighty good idea, and trust that the entries in this preliminary will be both numerous and good.

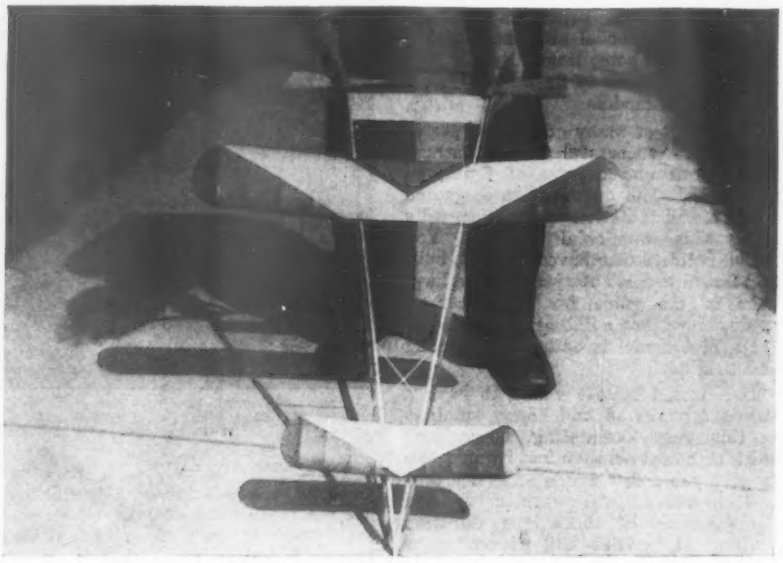
# How to Build the "Sky-Flyer"

*by* "POP STICK"

(See plan drawing on opposite page)

IN THE following article, a description of an exceptionally good flyer is given in detail and the results have so far helped to prove that this model should become a consistent winner in contests.

The various photographs illustrate the clean cut lines and the beauty of the red and white color scheme carried through on the wings. The total weight of the model is just a fraction under an ounce and a half. The ten inch propellers have a pitch of fifteen inches, utilizing six strands of 1-8 inch flat rubber strands for each prop. This combination takes the model out of the featherweight class and because of the wonderful flights obtained it becomes truly a flying model and not a floater. It climbs very rapidly at a steep angle and continues until the motor is entirely unwound.



Here is the completed twin-pusher "Sky-Flyer" ready for business. A dandy looking model and a good flyer.

### THE "A" FRAME

THE simplest and yet a very important part is the "A" frame. It must be strong and rigid and lined up true on each side. Where the two ends meet at the front point, be sure to cut the angles so that when held together they will not tend to bend at the center when they are separated at the rear end to the required width.

The point may be held together temporarily with a rubber band or a pin until the rear vertical rigid stabilizer has been built between the wide end. The next step is to add the center cross brace, allowing the ends of the bamboo to project on either side of the frame for adjustment.

The frame should be sighted down the sides and trued up. Then apply cement at the inside of the frame at the cross piece. The ends that protrude ae then cut short and additional cement is added.

When the frame receives hard knocks in landing it tends to split where the cross-braces have been forced into the sides. To prevent this, put two or three turns of thin silk thread (red) on both sides of the brace, cementing in place.

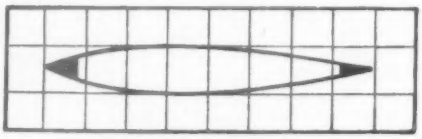
### MAIN WING CONSTRUCTION

THIRTEEN ribs are required for the main wing. Be sure and check over the wing curve carefully, noting the position of the three spars, and in particular, the curve in the under side. By using three spars, the wing when completed becomes very rigid and strong. A large number of spars prevent any undue warping and allow the tissue to be drawn very taut, giving a smooth surface to the finished wing.

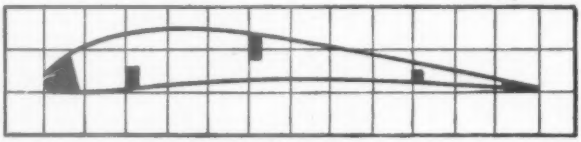
The ribs are set two inches apart and the top spar is sunk into the rib far enough so that the curve on the top of the wing will not have an angular finish. The leading edge is made heavy to prevent any breakage as all the shocks are usually absorbed by it.

The center section of the main wing is built up and the dihedral starts on the third rib out from the center—on each side. The wing tips are raised one and one-half inches. The wing tips are of bent bamboo and both should be exactly alike as they are cut from one piece after it has been bent.

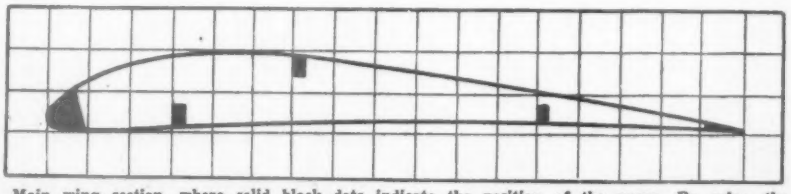
When assembling the wing tips to the center part of the main wing, brace in position by placing a block near the tip and underneath from the leading edge to the trailing edge. Two blocks of the same size should be used and spaced equally on both tips, then pinned down and held in position until the entire wing is dry, after being cemented.



Rear Stabilizer section.



Front stabilizer section.



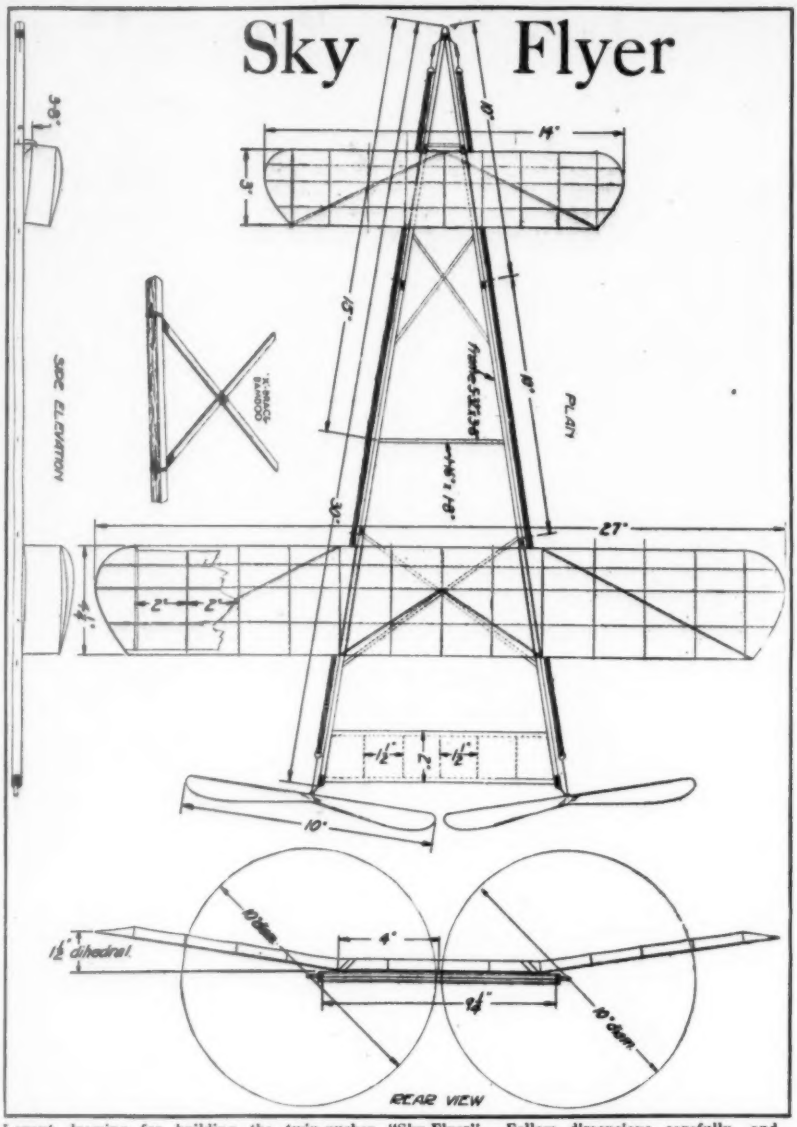
Main wing section, where solid black dots indicate the position of the spars. By using the squared diagram, you will find it easy to get the correct wing section

### FRONT STABILIZER

THE front wing, also classified as a "stabilizer," is built in a similar manner to the wing described with the exception that the dihedral starts at the very center and is also an inch and a half high at the wing tips.

A large dihedral in the stabilizer will help to give the model greater stability, especially on a windy day, and the maximum amount recommended should not be over two and one-half inches on each side.

The small elevation blocks should raise the stabilizer leading edge three-eights of an inch above the "A" frame. Both wings are held in position with rubber bands so that the adjustment is readily accomplished. However, the stabilizer remains in one position, but the main wing is moved fore-and-aft to secure proper balance.




Layout drawing for building the twin-pusher "Sky-Flyer". Follow dimensions carefully, and study the text before proceeding with the work.

*Material List For Twin Sky-Flyer*

| | | | |
|---|---|---|---|
| **Main Wing and Frame** | | | |
| Longerons or "A" Frame | 5/32 x 3/8 x 30" | Balsa | 2 pieces |
| Spars | 1/16 x 1/8 x 30" | Balsa | 3 pieces |
| Entering Edge | 3/16 x 3/16 x 30" | Balsa | 1 piece |
| Trailing Edge | 1/16 x 3/16 x 30" | Balsa | 1 piece |
| Rib Stock | 1/16 x 2 x 24" | Balsa | 1 piece |
| Braces and Tips | 1/16 x 1/4 x 12" | Bamboo | 5 pieces |
| Fittings | .029 Diameter | Piano Wire | 18 inches |
| Thrust Bearings | Medium | Steel | 2 parts |
| Washers | 1/8" O. D. | Brass | 6 pieces |
| Motor | 1/32 x 1/8" x 15 ft. | Rubber | 2 sets |
| Propeller Blocks | 7/8 x 1 1/8 x 10" | Balsa | 2 pieces |
| **Elevator and Rear Stabilizer** | | | |
| Leading Edge | 3/16 x 3/16 x 30" | Balsa | 1 piece |
| Trailing Edge | 1/16 x 3/16 x 12" | Balsa | 1 piece |
| Spars | 1/16 x 1/8 x 15" | Balsa | 3 pieces |
| Rib Stock | 1/32 x 2 x 8" | Balsa | 1 piece |
| **Miscellaneous** | | | |
| Tissue | 18 x 24" | Red | 1 sheet |
| Tissue | 18 x 24" | White | 1 sheet |
| Tissue for striping | 1 x 18" | Black | 1 strip |
| Dope for cementing tissue | large | clear | 1 bottle |
| Cement for wood parts | large | clear | 1 tube |

### REAR STABILIZER

THE rear stabilizer, which is located at the wide part of the "A" Frame, takes the place of a bamboo brace and in addition it becomes a longitudinal stabilizer for the model. The rib section is equally divided above and below the center line. It simply becomes a streamlined form acting in a double capacity as explained above. It also gives the model a distinctive appearance over other types that use only a brace.

### MISCELLANEOUS FITTINGS

THE sketches illustrating the fittings necessary for the model clearly show the correct shape and forms required. The wire is .029 inch diameter and should be of the tinned kind. Tinned piano wire does not rust after becoming damp and will always maintain a very highly polished surface. The loops on the shaft should not be over a quarter of an inch in diameter. The length of the shaft should not be less than an inch and three-eights from the outside of the propeller to the end of the loop.

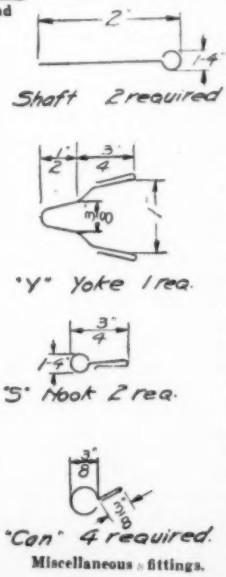
The overall length of the "S" hook should not exceed three-quarters of an inch. The loop end should not be over a quarter of an inch in diameter. The long part that extends beyond the loop prevents the "S" hook from twisting or jumping out of contact with the "Y" yoke. The overall length of the "Y" yoke is an inch and a quarter and the hook is three-eighths of an inch long.

It should be bent so that the position of the rubber is held away from the frame with a clearance of not less than one-sixteenth of an inch or up to three-thirty-seconds. This space is sufficient to allow the rubber to untwist freely without striking the frame and thereby causing the propeller to revolve in jerks. The anti-buckling guides are made with the loop having a diameter of not less than three-eighths of an inch and not over one-half inch.

Care should be taken to make the bends uniformly and without kinks, for kinky fittings cause binding and other troubles in flights.

The part that rests against the frame is three-eighths of an inch long and the position is such that the guide receives the rubber from the top side. Two of these guides are required on each side of the frame. Their purpose is to help to retain rigidity in the longitudinal members of the frame. When the model

(*Continued on page 58*)




Miscellaneous fittings.

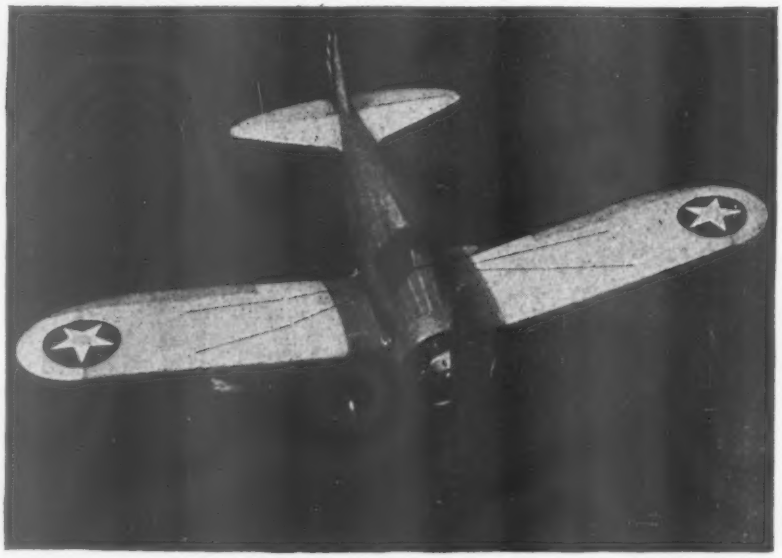
# Building the Boeing Low-Wing Pursuit Plane

*by*

JOSEPH S. OTT

Model Editor

*A true scale model, having exactly the proportions of the large ship, which flies very well and shows great stability.*



Here is the completed Boeing Low-Wing Pursuit plane, an exact scale copy of the large ship which has aroused such great interest in aviation circles.

THIS month's model is a reduced scale copy of the speediest, American military pursuit plane developed to date.

Every part of this model is true to scale, and to keep the weights in proportion so that the front of the machine will be heavy and bring the center of pressure far enough forward, a complete dummy motor and cowl are added.

This will add additional weight to the finished model but not so much that the flying qualities will be impaired. All of the controls are built up separately and are attached by cementing them in their correct positions on the wing or stabilizer or against the fin with a small length of soft wire.

This piece of wire should be bent over into a small circle at each end and rested against the ribs. The diameter of this wire used for a hinge should be about .020 inch.

Flying scale models appearing in this department in the past have had a wing spread of 15 or 30 inches. The smaller sized models are easily and quickly built and require a minimum amount of material.

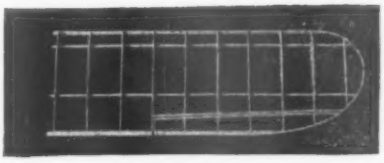
The 30" model requires approximately three times as much material, and in some cases, the weight increases and makes the completed large plane fairly heavy. This month we are compromising and using a dimension between the large and the small size.

The weight of the finished plane illustrated is a fraction over one ounce and the wing span is 22". After the

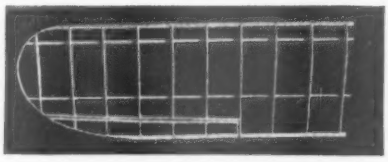
(*Continued on page* 46)

*List of Materials*

| | | |
|---|---|---|
| Longerons | 1/16 x 1/16 x 18" | 8 |
| Fairing Strips | 1/32 x 3/64 x 18" | 20 |
| Spars | 1/16 x 1/8" x 18" | 4 |
| Leading Edge | 1/8 x 1/8 x 18" | 2 |
| Trailing Edge | 1/16 x 1/8 x 18" | 2 |
| Rib Stock | 1/32 x 2 x 18" | 1 |
| Bulk Heads | 1/32 x 2 x 18" | 1 |
| Struts | 1/8 x 2 x 3" | 2 |
| Propeller | 8" diameter | 1 |
| Nose Block | 1/2 x 1¼ diameter | 1 |
| Motor Drum | Left overs from rib stock | 1 |
| Boots | 3/8 x 1½ x 3" | 2 |
| Wing Tips | Bamboo Strip | 1 |
| Tail Outline | Bamboo Strip | 1 |
| Tail Ribs | 1/32" Left overs from formers | 1 |
| Tail Spars | 1/32 x 1/8" x 18" | 1 |
| Windshield | 1" x 2" Celluloid | 1 |
| Motor | 1/32 x 1/8" x 8 ft. | 1 |
| Wheels | 1 7/8" diameter | 2 |
| Washers | 1/8" O. D. | 3 |
| Shaft | .024" diameter | 1 |
| Bearing | 1/2" diameter—Hard wood | 1 |
| Tissue | 2 sheets | 2 |
| Cement | large tube | 1 |
| Dope | large jar | 1 |
| Lacquer | Brown and Red | 2 |
| Emblems | Stars | 4 |

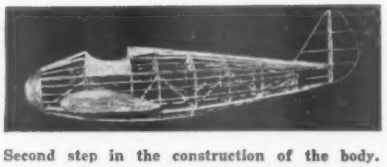


Right hand wing frame.

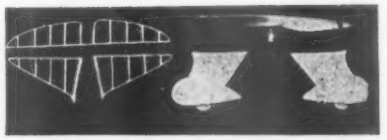


Left hand wing frame.

First step in the construction of the body.



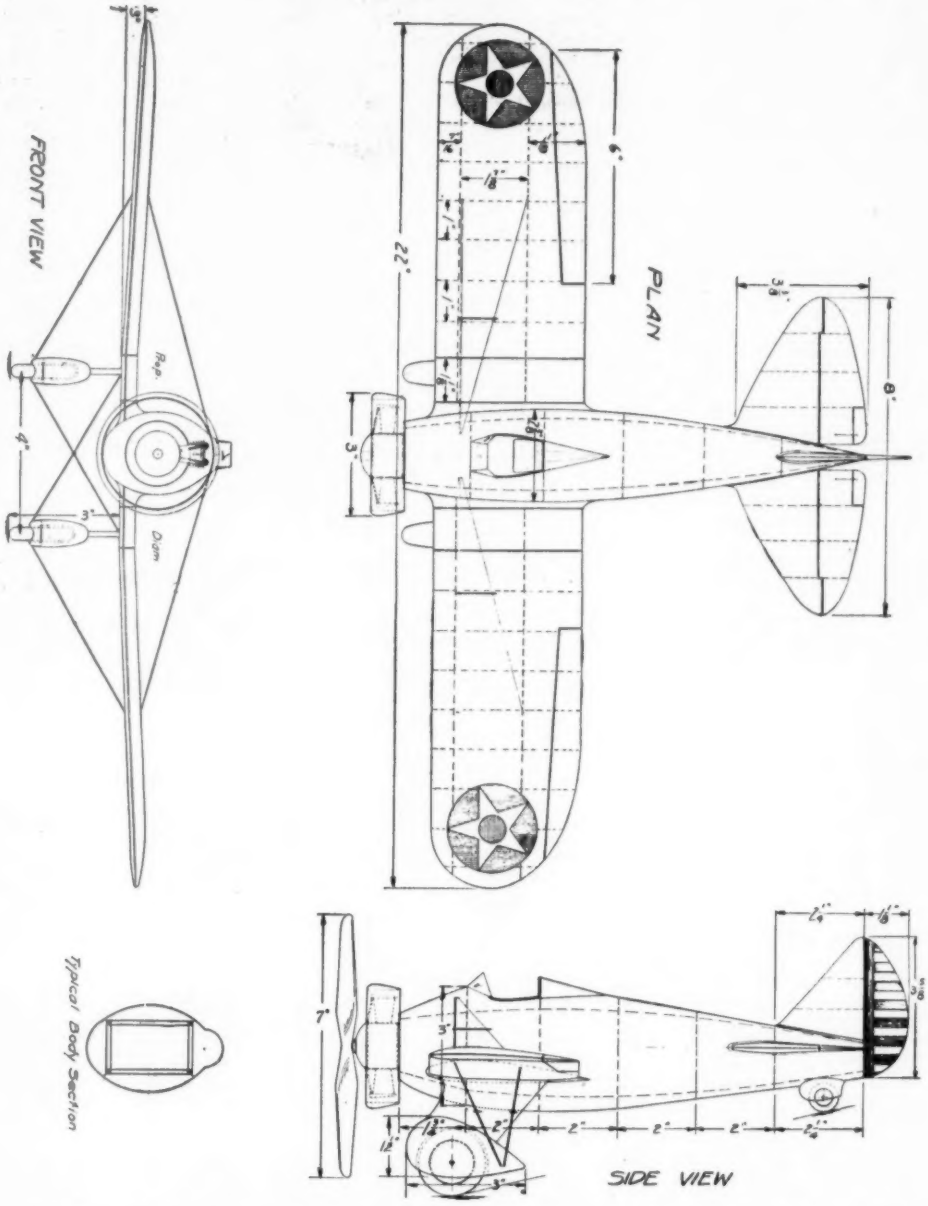
Second step in the construction of the body.



Stabilizer-Propeller-Boots and Struts.

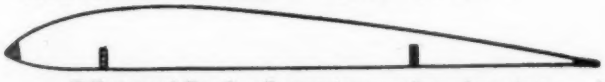
# The Boeing Low-Wing Pursuit Plane

## *A Flying Scale Model*




Carefully follow the dimensions given above, particularly the dihedral angle of the wings, the sizes of the tail group members and their location. A full description of the construction will be found on opposite page.

Rib for 22" Model Scale full size.



**Follow carefully, the rib curvature as given above, tracing off directly for the 22-inch model or enlarging proportionately for larger models.**

## Boeing Low-Wing

*(Continued from page 44)*

test model was completed, it seemed to fill a gap between large and small sizes.

BODY CONSTRUCTION

THE body is built up of numerous formers throughout the entire length The formers are not one solid section but are built around a square body and faired by using numerous longitudinal fairing strips the full length of the body, cementing them directly on top of the oval shaped sections.

The number of these fairing strips will govern the circular shape of the body. The closer they are together, the rounder the body will appear. The side elevation clearly shows the square shape necessary before the formers are added. The top view illustrates the width of the body at the various sections.

Note, particularly, that the front of the machine to which the motor is attached is built up of two circular discs and a thin sheet of balsa is cemented about these discs. The nose part is a separate piece and contains a hole approximately 5-16 inch in diameter.

The cockpit sides are thin balsa for a distance of 5-8 inch. The headrest is formed of a thin piece of balsa and starts on the former at the end of the cockpit. The tail-wheel is built into a small boot and this unit is attached to the lower side of the fuselage against the fairing strips.

The motor is made up of small cylinders which may be purchased separately and cemented in place around the builtup balsa drum described above. The cowl, which streamlines the motor, is built of 1-20 inch balsa wrapped around a 3 inch diameter tube for a thickness of three layers with paper in between. The inside view is left flat as seen on the side elevation of the drawing and the outside of the cowl ring is streamlined to the shape illustrated.

ABOUT THE WING STUBS

THE wings are attached to stubs which, in turn, are cut from a solid piece of very light balsa and mounted directly against the fairing strips on the body.

The inside of the wing stubs should be hollowed for lightness. Some of the fairing strips may be cut away so that the inside of the wing stubs rest against the square section of the body.

WING CONSTRUCTION

EACH wing contains ten ribs, all of the same shape and length with the exception of the last three which are a trifle shorter. The aileron ribs are cut off and by placing a small auxiliary spar on the wing side, sufficient length remains to make a full depth aileron.

It is not necessary to make all the controls entirely separate and attach them to their correct positions, but it helps to balance the model both for torque and climbing angle. The first part of the wing out from the wing stub is on an even plane and the dihedral begins at the second rib.

STABILIZER AND ELEVATORS

THE stabilizer is built in two sections and is attached to the body in a similar fashion to the wing. At the point where it is attached to the body a small streamline stub is used, one on each side.

The general shape of this stub is similar to the rib shape except that the part nearest to the body is approximately twice as deep so that sufficient material is had to give the tapered streamline necessary so that the completed appearance resembles the big machine.

RUDDER AND FIN

THE fin and rudder are on the extreme end of the fuselage and the rudder completes the streamline of the body. The attachment of the fin is made with a small stub similar to the stabilizer or wing. The rudder is attached at two points with soft wire which act as a hinge. Soft wire is used so that the controls may be bent innumerable times without breaking off.

PROPELLER AND RUBBER MOTOR

THE propeller is carved in the usual manner and the shaft is placed through the thrust bearing and then pierced through the thickness of the propeller, folded over at right angles, and pulled back into the front side.

Five to seven strands of 1-32 x 1-8 inch rubber will be required to fly the model. As the entire thrust bearing and propeller units remove from the nose of the body, the rubber may be attached to the shaft and pulled in place with a string which is first dropped through with a weight attached to the end.

The rear of the rubber motor, attached to a cross piece, is reached through an open side at the rear of the fuselage.

BOOTS AND STRUTS

THE boots are short and stubby and are tilted at an upward angle and attached to the wing by a solid balsa strut.

The boots are made of three units: a center section which equal to the thickness of the wheels to be used and two side pieces that fill and complete the outside shape. A wire axle cemented about an eighth of an inch from the lower edge of the boot through the wheel holds it in position.

COLOR SCHEME

THE Army colors are used and a suitable tissue is a dark brown or khaki color. The entire body and wing including the controls may all be the same.

Orange tissue may be used on the wings and tail units. Stars are pasted in place on the wing tips, above and below. The rudder has the blue upright stripe with the vertical red and white.

END.

## Howl Dept.

*(Continued from page 24)*

*merce should have control of all civil flying in the country and that the States should be deprived of all power to regulate aircraft in any way. Would it be Constitutional for Congress to pass a law depriving the States of all power to regulate flying and give all such regulating power to the Department of Commerce?*

*If Constitutional, I would like to see such a bill passed with a provision in it for a new Non-Commercial License for those not engaged in commercial work. This new license should be granted on inspection of the plane and no A. T. C. nor stress analysis should be required.*

*If it is not Constitutional for Congress to pass a bill with the above provisions, I am in favor of trying to get the Constitution amended to give all regulating power to the Federal Government. What do you think of my idea? I believe that if* POPULAR AVIATION *will get behind a movement of this kind we can put it over.*

*We are fortunate in West Virginia in having more liberal regulations than most States with State regulation but I can sympathize with those in other States which have the unreasonable brand. I believe Federal control is the only solution to our problem and I would like to hear from others just what they think of my idea.*

*Yours truly,*

*A. C. Fowler.*

* * *

THEN we have a letter from a real pioneer, A. H. Morris, 2401 Ingleside Ave., Cincinnati, Ohio. He is one of our readers who agree with the contents of Mr. Long's letter published in the last issue of POPULAR AVIATION. He, as is the case of most of us, believes that too many restrictive laws are stifling the progress of aviation development and invention, and being an oldtimer, has seen the same harmful reaction in other industries. Here is Mr. Morris' letter:

*I have finished reading, in the last edition of your paper, a very pertinent article by Mr. Leslie Long, regarding proposed and existing laws affecting amateur aviation.*

*The writer is a pioneer in this field, having constructed and flown models as early as 1895—only a short time after the famous Lawrence Hargrave, of Sydney, New South Wales. As you will note, this was several years prior to the Wright Bros.' experiments.*

*I discussed aviation in all of its ramifications with Langley, as far back as 1898. As my credentials show, I have worked in every department of all the large airplane factories in the East on many different types of planes.*

*I have been employed by The Standard Aircraft Co., C. Vought-Curtiss-Sperry, F. W. F. Engineering Co., At-*

*lantic (since merged with Fokker) and Fokker also have cited these facts, so that you can gauge the breadth of my experience.*

*I am wholly in sympathy with the views expressed in this article, strangely maintaining that these hide-bound laws re-act very badly on those posessing any originality in construction.*

*I would suggest that you go a step farther in denouncing a system which is positively stifling to aviation as a whole.*

*I have at hand a splendid article copied from a British publication, which parallels the truth as presented by Mr. Long. Since aviation is practically in its infancy, it is detrimental in the extreme to hamper and hedge it in by inflexible legislation.*

*I am interested to know if you have the courage to take a definite stand in this matter through the Medium of your excellent publication?*

*Yours sincerely,*

*A. H. Morris.*

We certainly do aim to see this thing through, Mr. Morris, and will do everything in our power to relieve the amateur from the unsufferable burden that has been placed upon him by the various political forces.

* * *

OUT of Tennessee comes another letter which backs up the fervent letter of B. H. Pietenpol published in a recent issue of P. A. It is from Jack Baumann, Route 6, Washington Pike, Knoxville, Tenn.

*Let me say right now that I stand by B. H. Pietenpol rigidly from spinner cup to the trailing edge of the rudder, when he says what he does about the Department of Commerce limitations on the home-builder and designer.*

*I am speaking for about 10 or 12 other boys and myself. We loudly bewail the fact that we have to have our designs (from now on) analyzed and approved.*

*Now please tell me why can't we have our designs and work approved to do away with those who refuse to do good work, like Pietenpol says. We're with you and would like to see something done about these laws. They are not causing any visible progress to the aviation industry.*

*What do the other clubs of gliders and airplane builders and designers, besides Pietenpol, think about it?*

*Hoping that we all may get something done about loosening things up, I am,*

*Yours sincerely*

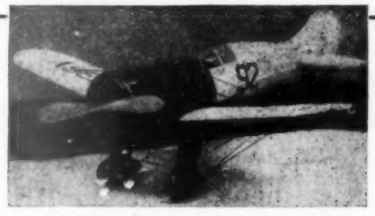
*Jack Baumann.*

*P. S. May be able to send you some interesting pictures before long.*

Fine. You're listed as a Brother Howler, in the amateur pack. Further, we hope to receive those photos before long for Our Readers' Department.

END.


BUILD THIS MODEL OF THE WEDELL-WILLIAMS RACER FOR REAL SATISFACTION



SKI-HI KITS ARE THE MOST COMPLETE ON THE MARKET

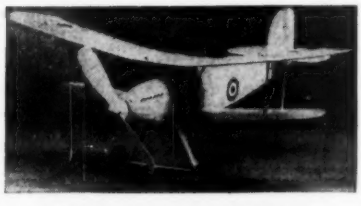
$1.00 POSTPAID

WEDELL-WILLIAMS

Build this snappy little model of the famous "WEDELL-WILLIAMS" RACER in which Jimmy Haizlip established a new transcontinental record. This model is a real flier, and the kit is the most complete you ever saw, containing, as do all Ski-Hi Kits, a READY-CARVED PROPELLER, colored tissues, formed wire parts, all wood parts stamped, full-size plans, in fact more than enough of everything to build this beautiful little ship. And new Ski-Hi methods of construction make it very simple to build. Also a similar kit for Jimmy Doolittle's GEE-BEE RACER. These planes are in proportion with each other, and make an ideal pair. Wing spans, 13 inches. Get your WEDELL-WILLIAMS or GEE-BEE KIT now, for only $1.00, postpaid.

SKI-HI "BULLET"—60c

The Ski-Hi "Bullet" is the best little flier, and the finest looking model you ever saw for such a low price. The kit is complete as the Wedell-Williams and Gee-Bee Kits, including the ready-carved propeller. Complete kit—wing span 12 inches, only ..... 60c Postpaid



HAWKER "FURY"—$1.50

The HAWKER FURY is the best flying scale model you could expect to see. It is a model, and a faithful one, of England's famous 300 M. P. H. Fighter. The complete kit to build this 18-inch marvel of the air, with READY-CARVED PROPELLER and all is only..... $1.50 POSTPAID

Please remit by Money Order only! Send 3c stamp for new illustrated price list. Dealers and clubs write for discounts.

SKI-HI MODEL AIRCRAFTERS—DEPT. J

SUNRISE GARDENS LYNBROOK, L. I., N. Y.



Model SUPPLIES at WORLD'S LOWEST CUT PRICES

The Most Extensive Line of Highest Quality Materials at Prices that Defy the Keenest Competition! Give Him an Assortment of Star Supplies—a welcome gift for any Model Builder. Orders shipped within 3 hours!

SUPER QUALITY ★ BALSA WOOD

(20" LENGTHS)

| | | |
|---|---|---|
| 1/16 x 1/16 | 20 for | .05 |
| 1/16 x 3/32 | 20 for | .05 |
| 1/16 x 1/8 | 20 for | .05 |
| 3/32 x 3/32 | 20 for | .05 |
| 1/8 x 1/8 | 20 for | .05 |
| 1/8 x 3/16 | 20 for | .09 |
| 1/8 x 1/4 | 20 for | .12 |
| 3/16 x 3/16 | 20 for | .13 |
| 3/16 x 5/16 | 20 for | .16 |
| 1/4 x 1/4 | 20 for | .17 |
| 1/4 x 1/2 | 3 for | .05 |
| 5/16 x 5/16 | 3 for | .05 |
| 1/2 x 1/2 | 2 for | .10 |
| 1/2 x 1 | 1 for | .06 |
| 1 x 1 | 1 for | .11 |
| 1 x 2 | 1 for | .20 |
| 2 x 2 | 1 for | .30 |
| 2 x 3 | 1 for | .40 |
| 2 x 6 | 1 for | .60 |
| 3 x 3 | 1 for | .50 |

20" SHEET BALSA

| | | |
|---|---|---|
| 1/64 x 2 | 5 for | .08 |
| 1/32 x 2 | 5 for | .08 |
| 1/20 x 2 | 5 for | .08 |
| 1/16 x 2 | 5 for | .08 |
| 3/32 x 2 | 4 for | .08 |
| 1/8 x 2 | 4 for | .12 |
| 3/16 x 2 | 2 for | .10 |
| 1/4 x 2 | 2 for | .11 |

PROP BLOCKS

| | | |
|---|---|---|
| 1/2 x 3/8 x 5 | 2 for | .01 |
| 1/2 x 3/4 x 5 | dozen | .10 |
| 1/2 x 3/4 x 6 | dozen | .11 |
| 5/8 x 1 x 7 | dozen | .15 |
| 5/8 x 1 x 8 | 3 for | .05 |
| 3/4 x 1½ x 9 | 3 for | .05 |
| 3/4 x 1½ x 10 | 2 for | .05 |
| 3/4 x 1½ x 11 | 1 for | .05 |
| 7/ x 1½ x 12 | 1 for | .05 |
| 7/8 x 1½ x 16 | 1 for | .09 |

PLANKS

| | | |
|---|---|---|
| 2 x 3 x 36 | | .45 |
| 1 x 6 x 36 | | .40 |
| 2 x 6 x 36 | | .80 |

★ Other STAR Alum. Supplies ★

SHEET ALUMINUM (12" wide)

| | | |
|---|---|---|
| .002 | per foot | .12 |
| .005 | per foot | .11 |
| .010 | per foot | .13 |

WASHERS

Large or small 2 doz. .03

EYELETS

3 dozen ..... .10

DOUBLE GEARED WINDERS

Each ..... .25

SANDPAPER

1 dozen sheets..... .10

REED

| | | |
|---|---|---|
| 1/32" diam | 6 feet | .04 |
| 1/16" diam | 6 feet | .04 |
| 3/32" diam | 6 feet | .04 |
| 1/8" diam | 6 feet | .05 |

BAMBOO

| | | |
|---|---|---|
| 1/16 x 1/4 x 12 | doz. | .07 |
| 1/16 x 1/4 x 15 | doz. | .08 |
| 1/16 sq. x 10" | 2 doz. | .05 |

AIRPLANE INSIGNIA

Stars in circle or bulls-eye (red, white, blue)

| | | |
|---|---|---|
| 1" diam | 8 for | .05 |
| 1½" diam | 7 for | .05 |
| 2½" diam | 6 for | .05 |

CELLULOID WHEELS in all colors

| | | |
|---|---|---|
| ¾" | per pair | .04 |
| 1" | per pair | .06 |
| 1¼" | per pair | .08 |
| 1½" | per pair | .12 |
| 3" | per pair | .25 |

DOUGHNUT RUBBER WHEELS

| | | |
|---|---|---|
| 1" diam | per pair | .13 |
| 1¼" diam | per pair | .15 |
| 1½" diam | per pair | .20 |

ALUMINUM TUBING

| | | |
|---|---|---|
| 1/16" O. D. | per foot | .06 |
| 1/8" O. D. | per foot | .07 |
| 3/16" O. D. | per foot | .08 |

DUMMY MOTORS 9 cylinder

| | | |
|---|---|---|
| 1½" diam | each | .16 |
| 2" diam | each | .23 |
| 3" diam | each | .29 |

BANANA OIL

| | | |
|---|---|---|
| 2 ounces | | .07 |
| Pint | | .48 |

ACETONE

| | | |
|---|---|---|
| 2 ounces | | .07 |
| Pint | | .48 |

ALUM. DRAG RINGS

| | |
|---|---|
| 1½" | .12 |
| 2" | .14 |
| 2½" | .17 |
| 3" | .20 |
| 3½" | .25 |
| 4" | .30 |

ALUM. COWLINGS Open or Closed Type

| | |
|---|---|
| 1½" | .13 |
| 2" | .15 |
| 2½" | .18 |
| 3" | .22 |
| 3½" | .25 |
| 4" | .30 |

BLACK CELLULOID PANTS

Pair ..... .25

SMALL PANTS

1¾" long, for 1" and ¾" wheels...pair .14

BLACK CELLULOID COWLINGS

Each ..... .20

COLORED DOPE

Colors: Orange, red, green, silver, yellow, blue, black, white, buff, navy grey, Mahogany, olive drab

| | |
|---|---|
| 1 oz. | .07 |
| 2 oz. | .10 |
| Pint can | .55 |

COLORLESS CEMENT

| | |
|---|---|
| 1 oz. | .08 |
| 2 oz. | .12 |
| Pint can | .70 |

THRUST BEARINGS

Small and large sizes:

| | |
|---|---|
| Each | .01½ |
| Per dozen | .15 |

CLEAR DOPE

| | |
|---|---|
| 2 ounces | .07 |
| Pint | .37 |

PARA RUBBER

No rubber over 5 weeks old

| | | |
|---|---|---|
| 1/16 flat | 50 feet | .12 |
| | 225 feet | .50 |
| 1/8 flat | 50 feet | .13 |
| | 225 feet | .55 |
| 3/16 flat | 50 feet | .17 |
| | 225 feet | .75 |

JAPANESE TISSUE

Red, blue, green, white, orange, yellow..... .5 sheets .10

MUSIC SPRING WIRE

.014, .020, .028, .034..... 16 ft. .05

HOW TO ORDER:—

Include 15 cents to all up to a $1.50. Orders of $1.51 and over, add 10% for packing and postage. (Orders west of Mississippi, add 10 cents extra.)

On all Canadian and foreign orders up to $1.50, add 25c. On orders of $1.51, and over add 15% for packing and postage.

NO DISCOUNTS ON ABOVE PRICES. NO CATALOGS SENT.

STAR . . . . . ★

MODEL AERO SHOP

10-12 Pearl St., Newark, N. J.

"The boys of the club agree with me that

# Your Company Can't Be Beat for SERVICE, nor Your Models for True Flyers!"

"The fact that your (Comet) models are designed for simplicity and flying quality sets your company apart from some others who either put out planes that are complicated jobs for experts, or are incomplete and no fliers at all. We have had experience with both and certainly appreciate your products. I wish to compliment your company (Comet) on its service and completeness of its kits!"—LLOYD GABRIEL, Mich. (Letter on file).

**Note to Reader:**—We are proud to print Mr. Gabriel's kind letter. It is one of many received from customers complimenting our quick service, completeness of kits, ease in building our planes, and telling of fine, thrilling flights. If you want thrilling FLIGHTS—a **Free** Glider and **Free** Catalog—order kits today, or tell Santa (dad) to order Comet Kits—on the "send no money" coupon!

"Your materials finest, models good looking, your prices very low and the . . . .
best flyers I ever saw!"
COMET
5 REASONS WHY YOU SHOULD BUY AND FLY COMET KITS:
"COMET KITS SCORE THE HITS"
THE DIPPER
The HOWARD RACER
ZIPP
CURTISS ROBIN
The DART

## "Dipper FLEW 900 FEET"

***"Received Comet Dipper, and it was packed the best and best material I ever saw! I easily built it and it flew over 900 feet its first flight!"—Rob't E. Latas, Colo.—(Letter on file).***

**EASILY, QUICKLY BUILT!** This amazing blue-white Dipper rises off ground, flies like an eagle, weighs ¼ oz.—costs only 50c prepaid! Easily built like ALL Comet kits! COMPLETE kit packed in colored box, has rubber motor, Jap tissue, balsa "prop" blank, bamboo, wheels, wire parts, balsa parts. FULL SIZE 3-VIEW plans, banana liquid, cement, EVERYTHING needed. Thousands built, flown! FREE GLIDER included! Order on Coupon **quick.**

**EACH COMET KIT PACKED in "GIFT" BOX!** See photo at right! Get the **best** kits at **low prices!** our nationally famed SERVICE pleases all! Order now from this and opposite page!

**Christmas Gift De luxe NEW U. S. NAVY RACER**

**(In Silver Box)**

Beautiful red, blue and silver box (Xmas Gift Box) contains ALL materials, 3-view, FULL-size plans—**everything** you need to get the **biggest** thrill of your life—building, flying this sensational looking Navy Racer! Costs only $1.50 prepaid and you get FREE formed **Celluloid Prop,** and FREE Glider! Plane colored red, white, blue! Easily hand-launched **for land flying**—rises off water, too! Hurry! It's the **Xmas gift deluxe!** Tell dad or mother you WANT this kit! Or order NOW on Coupon! (Note: EACH Comet kit packed in beautiful, colored box!)

Only **$1.50** Prepaid

## "DART IS MOST PERFECT FLYING MODEL I EVER MADE!
## LONGEST FLIGHT 2000 FEET!"

"Our Comet Dart flew over 2,000 feet distance and over 150 feet altitude. It was also our **speediest model.** "EMIL VON CZERKAS and RAYMOND PAULIS, N. Y.—(Letter on file).

Gang, build this **big, proven,** speedy long-distance ship! Costs you only $1 prepaid! **Think of it!** 22" by 16½". Easy to build. Detachable wings! Wow! Here's BIG fun. Big flights! And the big, complete kit in box with Free Glider. $1 prepaid. Order **quick**—PLEASE! You'll be glad you did!

**Comet's Famous DART!**

**22" Span**

**Length: 16½"**

Only **$1** Prepaid

## "MY COMET HOWARD RACER LOOKS AND FLIES BETTER

***Than Any Scale Model I Have Made In 8 Years!"***

Writes J. M. West of No. Dakota. Letter on file.

And John Etherington of N. Y. writes, "My Howard Racer **averages 750 feet per flight!"** There never was a sweeter flying ship for the money than this Comet FLYING Scale Howard Racer! Get YOURS! COMPLETE KIT with ALL materials needed, 3-view, Full-size plans, etc. —only 75c prepaid in yellow-black box with FREE Glider! HURRY, order! Easy to build—like all Comet Kits!

**75c** Prepaid

**LOOK!**

**Comet's New, F-a-s-t**

**RED RACER!**

Wow! Speedy, beautiful, all-red color, gleaming black celluloid wheels —that's the Red Racer! A FREE Celluloid Prop included and Free Glider! COMPLETE kit costs only $1 prepaid. It's **waiting for you inside brilliantly colored box.** Get it! Build it quickly, easily—and fly it! Another Comet triumph! Big FUN for you. Order TODAY. Full size, 3-view plans, of course! Order on Coupon!

**$1** Prepaid

## "CURTISS ROBIN FLYS 5 TIMES AS FAR!"

"Thot my Dipper was wonderful, but the Curtiss Robin—Oh Boy! She flies 5 times as far! Hasn't landed on its back yet! Enclosing 75c for Howard Racer! —"Harry Magni, N. Y. (Letter on file).

Build this amazing **Flying Scale!** Look! One of the **surest** fliers in the great Comet line! Dead easy to build—is 17 ½" x 14"—costs only $1 prepaid. Why not get this red, orange and black beauty—and fly it like Harry Magni did! A perfect Xmas gift! **Complete** kit, full-size, 3-view plans, all materials, etc., sent you in big box, with **FREE** Celluloid Prop. and **Free** Glider! Order this bargain flyer today!

ONLY **$1** Prepaid

"Your service perfect—materials finest quality—models good-looking—prices very cheap—and the

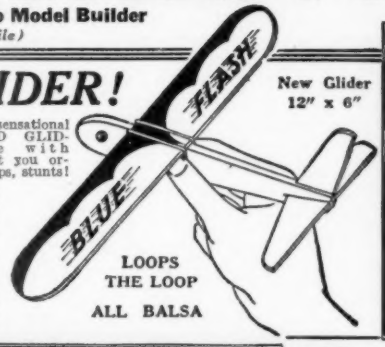
# BEST FLYERS I EVER SAW!"

**Writes Navaro Smith, Ohio Model Builder**
*(Letter on file)*

## FREE GLIDER!

New sensational COLORED GLIDER Free with EACH kit you order! Loops, stunts!

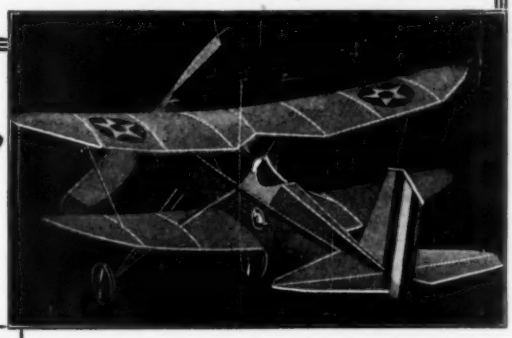
**MEN!** Give your Glider to some young friend. Also FREE: Remarkable 5-color, 24-page Catalog of Comet Kits, supplies—Free with your order! ALSO FREE WITH EACH $1 and $1.50 KIT: The amazing NEW Celluloid Propeller invented by the Third Man ever to FLY in U. S.! If you want this superpull, realistic, already formed propeller invention for 50c and 75c kits, mark coupon. 5", 12c; 6" and 7", 15c each. Colors: Red, Green, Yellow, Chalk-white. They BANISH prop carving job!




New Glider 12" x 6"

LOOPS THE LOOP

ALL BALSA



EACH COMET KIT COMES IN BIG "GIFT" BOX, brightly colored. A perfect kit in a perfect box.. Photo shows Pursuit box and partial view of kit contents.

**75c PREPAID**

Comet's C-1-Pursuit—Span: 15"—Length: 12¼"

## NEW ARMY PLANE! "Your C-1-Pursuit Made a RECORD FLIGHT of 1300 FEET."

"It was the easiest ship I ever constructed—the plans so easy to follow!"—Clyde Kowalka, Ohio. (Letter on File.) Looks like real biplane Army fighter with khaki fuselage, orange wings, red, white and blue rudder bars. Takes off, scuds thru the skies, makes 3-point landing. Easy to build. Thousands successfully flown! For a genuine thrill, get this C-1 Pursuit right now! Complete kit with ALL materials, 3-view, full-size plans, etc.—comes packed in big yellow-black box (photo below!)—only 75c prepaid. Free Glider included. Send Order-Coupon now!

## HOW TO GET REAL FLIGHTS!

Do this!—buy, build and FLY the greatest low-price line of FLYING planes—made by COMET! We design each Comet plane SPECIALLY to fly—and how they do! The letters from model builders shown on these two pages are like many hundreds and hundreds of complimentary letters we get telling how far, how fine their Comet-crafted ships flew—and how EASILY built! Now fellows, you can buy with FULL CONFIDENCE because we give you back your money if you aren't satisfied with your kits! EACH KIT comes packed in beautiful, colored "gift" box—has COMPLETE kit materials, full-size, 3-view plans, etc. There's a FREE Glider in each kit, and a Free, new Celluloid "prop" in each of the $1 and $1.50 kits. Each kit is priced LOW yet gives more than FULL value. Order now in Groups of 3 (for Xmas gifts) and SAVE CASH! Read below! Now!

FLYING SCALE!

Think Of It! Only $1 PREPAID

## New Heath Baby Bullet!

Here's the first FLYING Scale Heath Baby Bullet to sell at $1 prepaid. FLY? You tell 'em. Like a bullet! Being Comet-crafted, you KNOW IT'S EASY TO BUILD—and beautiful! Blue, orange—smoothest FLYER you ever FLEW! Hurry! It's new. Get yours quick! COMPLETE "super-value" kit packed in modernistic colored box with Free Glider and Free Celluloid "prop"—only $1 prepaid. Be FIRST to build, fly—others will envy your flights! Boy, boy! Wait'll you see it! Order on Coupon!

## SPECIAL Xmas Offer!

Read carefully—and SAVE CASH! Order now. Offer good limited time! Each Group saves you 25c! GROUP 1 consists of: Dipper (50c) Any 75c kit and any $1 kit. Total cost: $2.25. SPECIAL at $2 prepaid! GROUP 2 consists of: U. S. Navy Racer ($1.50) and any 75c kit. Total cost: $2.25. SPECIAL at $2 prepaid! 3 FREE Gliders with each group! One Free Celluloid "prop" with

**3 KITS Each in Gift Box $2**

each Group! Mark, mail coupon—order convenient C. O. D. "Send no money" way—today! QUICK SERVICE GUARANTEED!

## ORDER! SEND NO MONEY! JUST MAIL the COUPON

*SATISFACTION GUARANTEED or MONEY BACK!*

**Order from your Comet Dealer Always—If you have no Comet Dealer—Order now Direct!**

Order the convenient way—send no money—just mark, mail coupon. On delivery you pay postman for kits plus few cents postage, C. O. D. fee. Send cash and we pay postage! West of Mississippi, send 10c extra. Use money order. If checks, add 15c for exchange. Canadians remit 20% extra. HURRY! Order C. O. D. or cash—before we withdraw Free Glider, celluloid "prop" and Cash-Saving Group offers!

*"Send Me to Comet for a Merry Christmas, Boys!"*
*The Comet Kid*

## DEALERS! SALES GUARANTEED!

We Guarantee Sales on America's one and only 50c to $1 Line of FLYING Kits—make quick, proven profits all year! Start NOW! Send sample kit order on coupon! Write NOW for full details of Guaranteed Sale offer! "The only low-price, hi-quality line!"

## 5 COLOR CATALOG FREE!

Limited supply left of beautiful 24-page, 5-color Comet Catalog—the Advanced Catalog!—Biggest thrill you've ever had! FREE with order or just send coupon, enclosing 3c stamp for mailing! Thanks! Oh Boy! Get your copy.

**HURRY! MAIL COUPON NOW!**

COMET MODEL AIRPLANE & SUPPLY CO.
3114 Harrison, Dept. PA-13, CHICAGO, U. S. A.

C.O.D. ☐ Send me C. O. D. the articles I am checking. I enclose no money! I'll pay postman for articles ordered, C. O. D. fee, postage, ON DELIVERY. Comet GUARANTEES Satisfaction.

CASH ☐ I enclose $..... for articles checked below. Comet pays postage. GUARANTEES Satisfaction.

PRINT NAME..... PRINT STREET.....

PRINT CITY..... STATE.....

If you can't order a group of 3, write name of Kit or Kits wanted below this coupon; also write name of your Dealer!

WRITE NAME OF KITS YOU WANT

You Save 25c per Group!

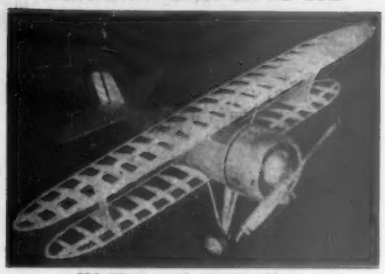
☐ GROUP 1: Dipper, (75c kit name:.....)
($1 kit name:.....)

☐ Group 2: U.S. Navy Racer (75c kit name.....)

CELLULOID PROPS:
Size.... Color.....
Quantity).....

Catalog, 3c stamp ☐

**LAIRD SPEEDWING**
**FLYING SCALE MODEL DE LUX**



22" Wingspread, Weight 2¾ oz.
This New Holland Balsa fuselage type model of Speed Holman's 200 M. P. H. Laird is the last word in accurate scale models. Set includes, finished fuselage, 9 Cyl. 3" celluloid motor, with aluminum front piece, streamline, aluminum special coral striped, carved silverized prop, all ribs and parts cut to size.
**Const. Set Complete**.....$ 9.25
**Ready to Fly**.....18.00
Other models of this type, Boeing P12E, Boeing XP936, Weddill Williams Racer, Curtis Hawk P6E.

**CURTIS HAWK P6E**

17" Span, Weight 1 oz., this specially equipped finely detailed model has brass exhaust pipes, aluminum pilot's seat, special aluminum wheels, insignia, special detail drawing, dope, glue, etc. Flies 450 feet. Const. Set $1.50.

**BOEING XP936**

17" Span, Weight 1 oz. The most realistic small model on the market, has 2" celluloid motor, aluminum front piece, finished cowl ring, aluminum pilot's seat and wheels, insignia, detail drawing, dope, glue, etc. Const. Set $1.65.

**World's Finest Model Motors**

½ H. P. Gas Motor

MODEL GAS MOTOR
½ H. P.

This is the smoothest running and only complete motor of its kind on market. Bore 1 1/16-in. x 11/16-in. 2500 R. P. M. comes complete ready to run with carburetor, gas tank, coil, battery, breaker point ignition, propeller, $35.00. 6 cylinder compressed air motor develops 1/5 H. P. driving 18" prop. at 1800 R. P. M.

This new supercharged air seal motor is fastest and most powerful air motor made. Price ready to run $12.50.

New 1933 illustrated catalogue 10c coin.

**Miniature Aircraft Corp.**
83 Low Terrace, New Brighton, N. Y.


## MODEL BUILDER

*(Continued from page 41)*

n work-board, a sharp knife, a pair of long nose pliers, a small vise, razor blade, draughtsman's compass, scissors, two-foot steel straight edge, small pins, pencil and several pieces of fine, medium and course sandpaper.

Balsa wood should be of the most satisfactory grade if you want to build successful long duration models. Balsa wood generally comes in three grades: hard, medium and soft and use only the best straight and most even grained stock of these grades. Do not accept any other balsa wood that is of poor quality, as it will bring you a good deal of grief.

There is much of this poor quality balsa wood being sold in the country so buy it only from reliable dealers who guarantee their quality. Also buy your other necessary model supplies of good quality such as ambroid or other forms of cement, acetone, banana oil, thread, Japanese tissue, music wire, bamboo and rubber. Be sure to keep covers on all containers of cement and dopes, or they will evaporate very quickly.

Preserve your rubber, which you have on hand, away from daylight as light is destructive to the rubber. When not in use, store away in French chalk.

END.


**WOBURN** SUPPLIES are in Demand Because of High Quality.

**24" BALSA STRIPS**

| | | |
|---|---|---|
| 1/32 x 1/16 | 9 for | 2c |
| 1/16 x 1/16 | 9 for | 2c |
| 1/16 x 3/32 | 9 for | 2c |
| 1/16 x 1/8 | 9 for | 2c |
| 1/16 x 3/16 | 4 for | 1c |
| 1/16 x 1/4 | 9 for | 3c |
| 3/32 x 3/32 | 9 for | 3c |
| 1/8 x 1/8 | 9 for | 3c |
| 1/8 x 3/16 | 9 for | 4c |
| 1/8 x 1/4 | 2 for | 1c |
| 1/8 x 3/8 | 3 for | 2c |
| 3/16 x 3/16 | 3 for | 2c |
| 3/16 x 5/16 | 3 for | 2c |
| 1/4 x 1/4 | 3 for | 2c |
| 1/4 x 1/2 | 3 for | 4c |
| 5/16 x 5/16 | 3 for | 4c |
| 1/2 x 1/2 | 2 for | 5c |
| 1/2 x 3/4 | 2 for | 7c |
| 1/2 x 1 | 2 for | 9c |
| 1 x 1 | 1 for | 8c |

**Japanese Silk Tissue Paper**
**Grade A:** Size 20 ½"x24 ½" Colors: Red, white, blue, green, orange, olive brown. 2 sheets, 5c; 25c doz.
**Grade B:** Size 20" x 30" Colors: red and green only. 3 sheets, 5c; 18c doz.
Black **English Parachute.** Size 20" x 30". Color: Black only
5c sheet; 6 sheets 28c

**MICROFILM**
Several times stronger than Superfine tissue, and aluminum leaf; also lighter and easier to handle. Per sheet 5c. Approximate size 8" x 12".
**Special Colored Dope** New low prices: Small bottle, 5c; 1 oz. bottle, 12c; 4 oz., 40c. Comes in following colors: Red, blue, black, white, green, brown, silver, olive drab, yellow, cream, grey, orange and pink.
**MUSIC SPRING WIRE** Strong and light. Polished to prevent rusting. No. 4, 5, 6, 8, 10, 12, 14, 16, and 18: 10 ft. at 3c.
**COLORLESS CEMENT** Small bottle 4c: 8 oz. 40c. Large 4" tube 8c.
**THRUST BEARINGS or PROPELLER HANGERS**
Large size, 0.32 hole Each 2c; 16c per doz.
Small size, .025 hole Each 2c; 15c per doz.

**24" BALSA SHEETS**

| | |
|---|---|
| 1/32 x 2 | 5 for 8c |
| 1/20 x 2 | 5 for 8c |
| 1/16 x 2 | 5 for 9c |
| 3/32 x 2 | 5 for 11c |
| 1/8 2 | 4 for 12c |
| 3/16 x 2 | 3 for 12c |
| 1/4 x 2 | 2 for 12c |
| 5/16 x 2 | 2 for 13c |
| 1/2 x 2 | 1 for 9c |

**ALUM. DRAG RINGS**

| | |
|---|---|
| 1 ½" diam | 20c |
| 1 ¾" diam | 22c |
| 2" diam | 25c |
| 2 ½" diam | 28c |
| 3" diam | 30c |
| 3 ½" diam | 36c |
| 4" diam | 40c |

**ALUMINUM TUBING**

| | |
|---|---|
| 1/16 O. D | 2 ft. 11c |
| 1/8 O. D. | 1 ft. 7c |
| 3/16 O. D. | 1 ft. 9c |

**PARA RUBBER**
Made by nationally known manufacturers of Model Airplane Rubber. Tested by us and found to be superior to any on the market.

| | 50 ft. | 100 ft. |
|---|---|---|
| 1/32 sq. | 7c | 13c |
| 3/64 flat | 9c | 17c |
| 1/16 flat | 12c | 23c |
| 1/8 x flat | 13c | 25c |
| 3/16 flat | 19c | 37c |

**Washers for wheel hubs, etc.**
⅛ O.D. or ¼ O.D., 2 doz. 3c.
**CELLULOID SHEETS** For windows on cabin planes, windshields, etc. Size, ¾x1 ½, 2 for 1c, 12 for 5.
**WHEELS** Colors: Red, white, blue, black, green, pink, purple, yellow.

| | |
|---|---|
| ¾" diam | pair 4c |
| 1" diam | pair 6c |
| 1 ½" diam | pair 8c |
| 1 ½" diam | pair 12c |
| 1 ¾" diam | pair 27c |

**PANTS, black only**
**Streamliners for wheels** For ¾" or 1" wheel, pr. 15c. For 1 ½" or 1 ¾" wheel, pr. 25c
**DUMMY MOTORS, black only. 9 cylinder double impression.**

| | |
|---|---|
| 1 ½" diam | 15c |
| 2" diam | 20c |
| 3" diam | 27c |

**COWLINGS, black only**
2 ½" diam ... es. 20c

Ordering instructions: No orders under 75c accepted. Add 10% for packing and postage.
Send for FREE plans for Heath Baby Bullet and Price List.

**WOBURN MODEL AIRPLANE SHOP**
17 Belmont St., Dept. P-1)— Woburn, Mass.


## Airy Chat

*(Continued from page 6)*

first Wright biplane is to be installed in the new Industrial Museum in Chicago. We hope that this is the case, anyway. It belongs here.

* * *

THIS year will see the great Century of Progress Exhibition in Chicago, and while we have not yet received any definite program from the exhibition officials, yet we understand that they are making arrangements for a great aeronautical display inside the grounds of the exhibition.

However, the concessionaires have been more definite on this point, and there are prospects of wonderful exhibits on the outside of the fence. We are already receiving literature on the proposed exhibits and flight exhibitions to be held along the shores of Lake Michigan and on the outskirts of Chicago at the many airports.

The Goodyear blimp has already been hauling passengers around the fair grounds for several months, and other companies have scheduled flying-boat and amphibian service for the Fair season when it begins.

* * *

IT IS not the easiest thing in the world to get into the Air Corps, for according to my understanding, the Air Corps is not so hot for training civilians. What they prefer, is to give special flight training to the graduates of West Point who have had general military training. I understand that they wish to create a corps of flying officers rather than simply develop pilots from the citizen class.

* * *

THERE is no doubt but what the Autogiro has stimulated much in-

**BALSA WOOD STRIPPER**
(Patent Applied For)
Boys—you can now cut your own balsa sticks, tees and angles—quickly and accurately, in width from 11/32" to 3/4"—and up to 1/4" in thickness.
ZIP saves money—makes model building more exact and interesting.
Strongly made of polished metal with renewable razor blade. Hundreds already sold—you take no risk—money back if you want it. ZIP is the original stripper. Order now.
***Make extra money by being our agent.***
PRICE **75c** Each Postpaid
AERO MODEL BUILDERS' GUILD
234 Halsted Road Elizabeth, N. J.

terest in the helicopter during the past few months. We have received many letters from inventors and intending inventors of direct lift machines, many of whom have applied for patents or have had patents granted on various types of helicopters. This is quite interesting, and perhaps the age old problem of the lifting screw will soon be solved.

* * *

AND is that Barter and Exchange column growing! And still better, the barterers and traders are getting results. Mr. J. L. Rawlings and Charles Underwood, both of 6227 Byron St., have received so many answers to their notice that they have asked us to inform everybody that they have completed their deals long ago, and that it is useless to send any more letters.

Just here, is where we would like to make a special statement on this subject. The Barter and Exchange columns are open to those who wish to trade merchandise of various sorts, or who wish to purchase certain items, but it is not for cash sales. As soon as dollars and cents or selling enter into the proposition, the advertisement no longer belongs to this column. It belongs to the Directory or Classified advertising section.

* * *

THE nearest approach to stratospheric flying, via airplane, has been made by an Englishman. His altitude was 45,000 feet or about 9.5 miles above sea level. This is sure getting up into the world, but it is still shy of the stratosphere by a few thousand feet. Keep on pushing her up, boys, keep on pushing and you'll make it yet in spite of old man gravity.

* * *

YOU never can tell where this flying bug will sting next. Two middle aged women, past the 50 year mark, have been doing some excellent cross-country flying and deserve special mention in "Airy Chat." To my mind, a gold medal should be handed to women of this age who take up flying. It is a greater achievement than flying across the Atlantic in my opinion.

* * *

IT RATHER seems that builders of transport planes are up against a tough proposition unless they are directly associated with an airline. As most of the major airlines now own or control their source of supply, the outside independent builder is out of luck. He has only the smaller airlines available for disposing of his product or else he must engage in an export business. It is the old story of the railroads and the locomotive builders all over again.

* * *

FROM what we can see, the airplane model industry is by far the most prosperous of all the aeronautic activ-

(*Continued on next page*)


*Whether for Yourself or for Giving, - - -*

**SCIENTIFIC KITS** *are Practical and Always Welcome*

**Doolittle's Record-Breaking "Flying-Silo"---**
**A Thrill for Everybody with**

**GEE BEE SUPER SPORTSTER**

This is the true-to-life reproduction of the plane that broke all existing land speed records, travelling at the rate of 296 miles per hour. Looks just like the real ship. Here are the specifications: Wing span, 20"; Length, 14"; Weight 1¼ oz.; Colors, red and white. The Kit contains: Ribs, bulkheads, wing tips and other parts clearly printed on balsa; semi-finished propeller and pants; all wire fittings ready formed; finished turned cowling front; (no bamboo to bend); 1 oz. banana oil and colorless cement and special colored dope; tissue; rubber; all balsa strips cut to size, and of course full size plans and instructions **Actualphoto of the new GEE-BEE below.)** **1.50** Post Paid

*New!* **TRI-MOTORED STINSON AIRLINER**

26¼" Wing Span

What remarkable flying quality. What breath-taking performance. Every boy wants to build a Stinson Airliner. And just look at these specifications—Wing Span 26½ in; Length, 17⅝ in.; Weight, 1 oz. Here's what this Kit includes: All balsa clearly printed; 3 finished, turned balsa cowlings; finished balsa wheels with bushings; semi-finished (propeller; and pants, all wire fittings ready formed; all insignia and letters cut out and gummed; banana oil; colorless cement; colored dopes; fine tissue; bamboo; rubber motor, and balsa, strips cut to size Colors, Dark Green and White. Complete Full Size plans and instructions..... **1.50** Post Paid

**2-Ft. KELLETT AUTOGIRO**

Just watch the vanes rotate as it flies. Works on the same principle as the original ship. Will fly from 200 to 500 feet. An Autogiro Kit will make a most welcome gift for any boy or young man. Complete with everything (all ribs, wing-tips, bulkheads, etc., stamped on sheet balsa). Full size plans and instructions. **1.50** Post Paid

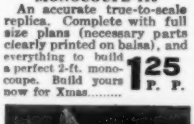
**SCIENTIFIC SOLID MODELS**
**OF 6 FAMOUS SHIPS 10" WING SPAN**
**AND WHAT MODELS THEY ARE!**

Their striking appearance when finished puts them in a class by themselves. Each kit includes full size plans, a liberal quantity of cement, colored dopes, and printed balsa. All 10 in wing span. Here they are—

Boeing Pursuit XP-936
Monocoupe 110
Pitcairn Sport Autogiro
Curtiss Fighter XF 9C-1
Berliner-Joyce Fighter XFJ-2
Wedell Williams Racer 92

**35c each**
**3 FOR $1.00**
(plus 5c postage for each kit)

**MONOCOUPE-110**
An accurate true-to-scale replica. Complete with full size plans (necessary parts clearly printed on balsa), and everything to build a perfect 2-ft. monocoupe. Build yours now for Xmas..... **1.25** P. P.



**GEE-BEE Sportster-D**
A model you will be proud to give or to receive. Everything for a complete 2-ft. Flying Gee-Bee (essential parts printed on balsa). Full size plans and instructions. **1.25** P. P.

**15" FLYING SCALE MODELS.**
**99c ea., postpaid.**
SE 5 British Pursuit — Fokker Triplane — Spad — Lockheed Vega.
**Complete in every detail.**

**PLANS**
For Lockheed Vega; S. E. 5; S. P. A. D.; Fokker Triplane; Curtiss Hell Diver; Curtiss Hawk P-6 E; Laird Super Solution and others.
**10c each or 3 for 25c**

Complete Line of A. M. L. A. Scale Model Plans Vought. Corsair; Boeing P-12; Waco Taper Wing; Lockheed Sirius and others, .....20c each

Scientific Double Geared Ball-Bearing Winders. New, large size..... **50c**

American Beauty Winders with automatic counters attached complete, Winder without counter 55c **3.50**

**MODEL SUPPLIES AT WORLD'S LOWEST PRICES**

**36" Scientific Balsa**
1/16x1/16..8 for 5c
1/16x⅛ ..7 for 5c
3/32x3/32..6 for 5c
¼x ½ ..6 for 5c
½x ½ ..6 for 10c
¼x ¼ ..6 for 15c

**36" Sheet Balsa**
1/32x2..... 4c
1/32x3..... 5c
1/16x2..... 5c
1/16x3..... 9c
⅛ x2..... 6c
¼ x2..... 10c

**Prop. Blocks**
⅜x ½x5..... 1c
½x ⅝x6..3 for 5c
⅝x1x8 ..2 for 5c
1x1 ½x12.....9c

**Thrust Bearings**
.025 and .035 hole each..... 2c

**Acetone**
Lge. 2 oz. can 10c

**Colored Dope**
Lge. 2 oz. can 12c

**Banana Oil**
Lge. 2 oz. can 10c

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Lge. 2 oz. can 16c

**Jap Tissue**
For the commercial ship. Sheet 20 ½ in. x 24"..... 5c

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Sheet 21" x 25" 2 for 5c

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Stars in circle or bullseye.
1" dia. ..6 for 5c

**Music Wire**
.014, .020, .028, .034, 15 ft. ..5c

**Celluloid Pants**
Pair ..25c

**Celluloid Wheels** with Bushings
Red, blue, yellow, white, green, black
⅜" dia. 6c pr.
½" dia. 8c pr.
1 ⅛" dia. 11c pr.
1 ⅜" dia. 16c pr.

**Rubber Air Wheels**
1" dia. 18c pr
1 ¼" dia. 20c pr.
1 ⅜" dia. 25c pr.

**Reed**
1-22", 1-16", 3-32" 6 ft..... 5c

Add 15c to all supply orders up to $1.50; above $1.50 add 10%.

**FREE: Complete Price List. Send 3c to cover postage.**

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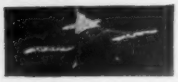
Build this life-like 14" flying scalemodel of the newest Trans-Atlantic plane. Air-minded boys everywhere acclaim our kit as a sensation. Complete with all necessary materials, plans, etc. 99c Postpaid

The Thompson Trophy Winner **Gee-Bee Sportster**



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Curtiss Navy F6C2 **Akron Fighter**

The Pursuit plane that is carried in the Navy Dirigible "AKRON" . . . a really snappy model that looks and flies well. 12" wingspan. Complete with everything, plans, etc. 99c Postpaid

**Jimmy Haizlip's** **Wedell Williams**

The plane that made the new transcontinental record at the National Air Races. Complete kit includes everything to make a perfect 14" flying model. 99c Postpaid

Remit by check or Money Order. Add 15% to Foreign orders

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**BUILD THESE**

**BEAUTIFUL MODELS**

**Exact scale miniatures of 10 FAMOUS PLANES!**

Pfalz Scout, No. AC-1
Rumpler, No. AC-3
Camel, No. AC-5
Travelair Mys., No. AC-7
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S.E. 5, No. AC-2
Nieuport, No. AC-4
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A-8 Attack, No. AC-8
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**MODELS ARE 6" TO 8" SPAN IN PROPORTION TO SCALE**

A-8 Attack 8" Wingspan

**BUILT ENTIRELY FROM KIT NO. AC-8**

These are the most complete kits you will ever have the pleasure of working from. They contain absolutely everything you will need, including such features as fully printed balsa parts, stamped fuselage block, correct insignias, and plenty of our brilliantly colored dopes, besides all the other parts needed to make a model that will look just like the real thing.

**START NOW!**

10 wonderful models to select from

Only 45c each P.P. ANY 3 for $1.10 P. P.

**FREE!**

**With Every order of either a kit or supplies. A detailed blueprint of our latest thrill for model builders.**

**THE ARIELCRAFT "GREEN FLASH"**

A 40" "A" Frame twin pusher with "hollow box" longerons, and many other brand new features. Designed to contest specifications.

*Send 3c stamp for our new big price list*

**ARIEL MODEL PLANES**

622 Hegney Place Dept. A New York City

ities. It is rapidly developing, and all indications point to still further development. Model building and flying is a real sport and diversion for all ages and races.

* * *

OUR lightplaners are a loyal bunch. They stick together—you bet. Just let some one tread on their toes, and the whole bunch jump on the intruders in one big rush. This spirit means that the gang are really going to get somewhere in spite of present conditions. The only difficulty lies in the fact that they are comparatively few in numbers and have no organization as yet. We'd like to see a letter come into this office bearing the head "Lightplane Association of America," or some such title.

* * *

IF WE could get a representative group of lightplane enthusiasts and manufacturers together to start this thing, we'd be happy. Just as a nucleus for starting something, we suggest that Leslie Long, B. H. Pietenpol, J. K. Corben, Manley Mills, Howard Tubbs, Storms of Spartanburg, Nagle, and others who are prominent in amateur aviation, be appointed as a temporary committee for getting this National lightplane organization started. All in favor, write "Aye".

* * *

A BIRD came running into the office the other day, all out of breath. Sez he, "There's a guy near where I live that is building a real airplane in his garage. What do you think of that—shall I write it up for you?"

I turned to the file and held up a mass of correspondence from "Our Reader's Column" fans, a bunch about four inches thick. "Here's a few more that have done the same thing," sez I, and our would be informant nearly fainted away.

J. B. R.

## Old Bill

*(Continued from page 14)*

first," he shouted above the noise of the motor. "After we get through with them climb her to three thousand and try a few hammer-head stalls." He turned, revved the motor for a few moments, nodded. I yanked the chocks.

Old Bill's helmeted and goggled head peered out of first one side and then the other of the cockpit. All clear. He gunned the OX5. The ship lunged forward, rolled a few feet and bumped to a stop as the motor gave a few irregular pops and cut out.

"Darn that carbureter!" growled Bill, climbing from the cockpit. "Water in the jets again. No, I'll drain 'em. Gimme a pair of pliers." He opened a small door in the motor cowling.

"Y' know," he ruminated to no one in particular, "these old OX's are the most swore at an' swore by motor of any motor in the world—but they've sure made a bunch of good fliers.

Minutes later. We stood and idly watched while the ship went into its first stall. . . . Soon the second, third—and fourth! Up she went in a graceful climb, reached the apex, quivered a moment before starting down—and to our ears came a faint popping. Water in the jets again!

We stood and watched as the spinning prop slowed and stopped, stood fascinated as the left wing went down and the ship dropped off into flat spin. Slow easy turns at first, then tighter and tighter, faster and faster, down, down, down, DOWN! If that motor would only . . .

For short seconds that seemed like ages I watched, then with a something choking in my throat I shuddered and turned away . . . waited. From out on the field came a loud, splintering crash. . . . Silence. Out near one of the runways a cloud of dust settled slowly back to earth.

END.

**THE FIRST REAL NEW IDEA IN MODEL BUILDING!**

***This Patented TRU-BILD Drawing eliminates guess work entirely.***

TRU-BILD is the result of considerable planning and experimenting by a well-known aviation engineer. You simply place your balsa on the TRU-BILD drawing framework or jig, apply glue and lift off sections in perfect alignment, doing the job in a fraction of the time spent formerly. With a TRU-BILD JIG DRAWING (Patented) you can build as many models as you choose and most important of all, you work in the same manner as mechanics in airplane assembling plants.

**COMPLETE TRU-BILD JIG DRAWING KIT**

Containing all necessary materials to build a 20½" wing-span Lockheed Vega similar to Amelia Earhart's transatlantic plane. All ribs, bulkheads, stringers, etc., die-cut to size, unlike any other kit. An educational and thrilling way for beginners and experienced model builders to construct real flying planes. 2.95 Postpaid

**DEALERS AND CLUBS: WRITE FOR OUR SPECIAL OFFER**

Send today for this marvelous TRU-BILD KIT. Remit by postal or express money-order. Add 15% for Canadian or foreign orders.

**TRU-BILD MODEL PRODUCTS CO., 442 WEST 27TH ST., DEPT. "P", NEW YORK CITY**

## War Medals

(*Continued from page* 12)

received nearly half, or 24 clusters, as follows:

| | |
|---|---|
| 1st Lieut. Edward V. Rickenbacker | 7 |
| 1st Lieut. Douglas Campbell | 4 |
| 1st Lieut. Frank O'D. Hunter | 4 |
| Captain Reed M. Chambers | 3 |
| 1st Lieut. Murray K. Guthrie | 2 |
| 2nd Lieut. Ralph A. O'Neil | 2 |
| 2nd Lieut. Glen A. Preston | 2 |

AND now you are wanting to know about the No. 3 pilot wearing the rainbow hued ribbon with a silver star. He had fought gallantly and heroically against great odds with jammed machine guns. By his daring, he unquestionably saved his two comrades from being caught in a Fokker trap.

What does the silver star represent? Why is his ribbon a different color than the other two pilots?

You should recognize the ribbon. It is the Campaign ribbon of the World War. Every man that saw military service has one. It represents the Victory Medal given to every officer and enlisted man of the American Army, Navy and Marine Corps, both in France and the United States, who saw military service between April 1917 and November 11, 1918.

But the silver star. That's another story. It tells you at a glance that he saw service on the Front and was cited for gallantry in action. But his deed of valor was not adjudged sufficient to win for him the Distinguished Service Cross or Medal of Honor.

The Silver Star Citation decoration was instituted July 1918 by an Act of Congress.

The citation must be in orders isued from the headquarters of a force commanded by a general officer, or by a colonel or other junior officer when in temporary command of a brigade or other unit which is supposed to be in command of a general officer.

There never can be any doubt regarding the sufficiency of any case as far as this qualification is concerned. The silver star cannot be shown for any act of gallantry for which the Medal of Honor or the D. S. C. has been given.

So the little silver star, one sixteenth of an inch in diameter on the rainbow campaign ribbon, is mute testimony that a man was cited for "gallantry in action" but was not awarded a medal for that particular deed.

* * *

AND now you're wondering about the stocky mechanic whose campaign ribbon is studded with four bronze stars. You have probably guessed it already, if you don't know. Those little bronze stars represent the number of "battle clasps" on the brilliant hued ribbon of his Victory Medal.

Such clasps are Defensive Sector clasps and were given for occupation of a defensive sector, or for participa-


# SELLEY'S CHRISTMAS VALUES!

## *Most Sensational Bargains Ever Offered!*

PERFECT HOLIDAY GIFTS! Here are a few of SELLY'S superior model airplanes and accessories. Choose from the world's best designed, quality-built construction sets. Never has *Selley* offered such outstanding values! Never have you had the opportunity to secure *Selley* Kits for so little! Order NOW! Make the holidays "happy days"!

Plans Alone 25c

**75c** Postage 25c

**PUSS MOTH**

Span 18", length 13". Flight 400 ft. Weight ½ oz. Plans alone... 25c

**BELLANCA AIRBUS**

**$2.00** 25c Packing Postage

Span 20", Length 13¾" Flight 200 feet. Weight ¾ oz. Plans alone 50c.

*Free!* Selley offers $10 In Merchandise *in this slogan contest!*

**PRIZE WINNERS**

First Prize, Five Dollars, John Pobuda, 6220 Southwestern Avenue, Chicago; Second Prize, Two Dollars, W. S. Van brockline, 1036 South Street, Roslindale, Massachusetts; Third Prize, One Dollar, each to John Morgan, 1534 Hubbard Street N. S., Pittsburgh, Pa.; M. Kobic, 319 Foundry Street, Medina, Ohio; M. Garnluhler, 208 East Ninetieth Street, New York City.

**YOU CAN WIN TOO!**

**Rules**

Send in a slogan of 20 words or less for Selley's Model Airplanes and Accessories.

The three boys whose slogans are judged best in the opinion of Mr. A. F. Selley and Mr. E. G. Ten Eyck will receive credit checks entitling them to their share of Selley merchandise. (Unrestrictd choice.) First—$5.00, Second—$3.00, Third—$2.00.

This month's offer expires December 31. If your slogan is received too late for this month's prizes, it will be eligible for next month's prizes.

If winning slogans are duplicated, each sender will receive duplicate awards.

**Send in your slogan today! Be sure to look for your name in our future advertisements.**

**$1.50 Official U. S. Army FALCON**

Postage 25c

Span 18", Length 13¼", Weight 1½ oz. Plans alone, 25c.

**$1.50 BELLANCA SKYROCKET**

18" Wing, Length 10¾", Flight 250 feet. Weight ½ oz. Plans alone.. 50c

Space does not permit picturing the beauty of these model airplanes

**REPLICA MODELS**

All parts, plans and materials, cement, lacquers and insignia to build: 12" Wing Span model of the following.

| | |
|---|---|
| Curtiss Army Hawk | $1.50 |
| Curtiss Army Falcon | $1.50 |
| Curtiss Navy Helldiver | $1.75 |
| Lockheed Sirius | $1.50 |

PACKING AND POSTAGE 25c

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| | |
|---|---|
| Fokker D7 | $2.00 |
| Alabatross | $2.00 |
| Spad | $2.00 |

PACKING AND POSTAGE 25c PER KIT

# PROPELLERS

CAST METAL

SPINNER TYPE STANDARD STEEL TYPE

**CAST METAL**

| 2 Bladed | 3 Bladed | | 2 Bladed | 3 Bladed |
|---|---|---|---|---|
| 3¼" .25 | | | 3¼" .20 | |
| 4" .30 | 4" .35 | Postage and Packing, 3c each. | 4" .25 | 4" .30 |
| 4½" .35 | 4½" .45 | | 4½" .25 | 4½" .40 |
| 5" .35 | 5" .50 | | 5" .30 | 5" .45 |
| 5⅝" .40 | 5⅝" .60 | | 6" .35 | 6" .60 |
| 6¼" .40 | 6¼" .70 | | 6½" .45 | |
| 7" .65 | 7" .80 | | 6¾" .50 | 7" .70 |

Propellers available in the following sizes: 8 in., 9 in., 10 in., 11 in., 12 in., 15 in., 18 in., 21 in., 24 in.

**SPUN ALUMINUM COWLS**

| Diameter | Anti-drag | Open Cowl | Closed Cowl |
|---|---|---|---|
| 1½" | .20 | .20 | .20 |
| 2" | .25 | .25 | .25 |
| 2½" | .28 | .30 | .30 |
| 3" | .30 | .35 | .35 |
| 3½" | .40 | .45 | .45 |

Cowls available: 4 in., 4½ in., 5 in., 5½ in., 6 in., 7 in., 8 in., 9 in., 10 in. Packing and postage, 6c each cowl.

Treaded Alum. Disc

| Dia. | Tail Wheel Aluminum Disc Rubber Tires Ea. | Treaded Wheels Alum. Disc Rubber Tires pr. |
|---|---|---|
| ½" | 5c | |
| ⅝" | 6c | |
| ¾" | 7c | |
| ⅞" | 8c | |
| 1 9-16" | 30c pr. | |
| 1¼" | .40c pr. | |
| 2" | .50c pr. | |
| 2½" | .60c pr. | |
| 2⅝" | $1.25 pr. | |
| 1" | 8c | 1" dia. 8c |
| 1⅛" | 10c | 1⅛" dia. 10c |
| 1¼" | 11c | 1¼" dia. 16c |
| | | 3" dia. 40c |

Postage, 4c pr. Rubber Tired, 3c pr. Untired.

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Complete with all material to make 5 perfect planes.

**65c**

Postpaid

This kit contains stamped balsa, cement, sandpaper, plans and even colored dopes—everything to complete these five perfect miniature scale replicas: Travelair "Mystery Ship", Fairchild "22", "Autogiro", Pitcairn "Mailwing", and Stearman "Cloudboy". Order a few 5-in-1 kits now for Xmas gifts. Remit by money order or check.

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**→SPECIAL GOGGLE AND HELMET OFFER←**

New high speed flying or racing GOGGLES, fitted with Resistal bent cylinder lens, air ventilators and latest style nose bridge, rubber trimmed. Standard Price $10.00

And our genuine cape leather chamois lined $5.50 Helmet in Black or Tan. Both Goggles and Helmet—

**$10.95**

Sent prepaid or C. O. D. — Deposit required on all orders. We do not issue catalogs.

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**FLYING BEN**

**Large 3½ ft. Model**
**MASTER OF THEM ALL**

**FINEST CRASH-PROOF FLYING MODEL EVER BUILT IN AMERICA. DESIGNED BY REAL AIRCRAFT ENGINEERS**

**Flying Ben** flew more than 100 times. Flown over 15000 ft. and still flies great. Strikes buildings, barns, trees, head on and does not break. The construction of this airplane and its materials are the finest. Contains no balsa wood. Flying Ben weighs 12½ oz., flies from 200 to 700 ft. with one winding. Has a propeller almost 13in. long. Powered by newly patented rubber band oiled motor. 3½ ft. wing spread and 22½ in. body. Shock absorbing, unbreakable landing gear. You can win a contest or prizes with this model.

**Price Only $3.95**

Actually a $25 value, but offered at only $3.95 postpaid. Flying Ben is 75% built. All you have to do is cover the wings and assemble it. Flying Ben also comes in a large four foot box complete and ready to fly for $2.00 extra. Here is your opportunity. If you want an airplane, get a good one. This offer is at factory prices to you.

**FLYING BEN MODEL AIRCRAFT CO.**
2659 N. Parkside Ave., Dept. 6, Chicago, Ill.

**FLYING BEN MODEL AIRCRAFT CO.**
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Chicago, Illinois.

[ ] $3.95 enclosed. Send me one Flying Ben Kit, built but not assembled.

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Name .....
Street .....
Town ..... State.....


## War Medals

*(Continued from preceding page)*

tion in any engagement enumerated in the thirteen major operations list. Only one clasp for a sector is given to any one individual although he may have seen service several different times on the same front.

Now I'll give you the list of the Thirteen Major Operations as officially recognized by the War Department. I'll also give the dates that a man had to be on a sector to be entitled to a battle clasp on his Victory Medal ribbon. Also, I have enumerated the approximate number of American soldiers of all branches of the service entitled to battle clasps of each defense zone:

| Sector and Date | No. of Eligibles |
|---|---|
| Cambrai—May 12-Dec. 4, 1917 | 2,500 |
| Somme (defensive)—Mar. 21-Apr. 6, 1918 | 2,200 |
| Lys—Apr. 9-Apr. 27, 1918 | 500 |
| Aisne—May 27-June 5, 1918 | 27,500 |
| Montdidier-Noyon—June 9-June 13, 1918 | 27,000 |
| Champagne-Marne—July 15-July 18, 1918 | 85,000 |
| Aisne-Marne—July 18-Aug. 6, 1918 | 270,000 |
| Somme (offensive)—Aug. 8-Nov. 11, 1918 | 54,000 |
| Oise-Aisne—Aug. 18-Nov. 11, 1918 | 85,000 |
| Ypres-Lys—Aug. 19-Nov. 11, 1918 | 108,000 |
| St. Hihiel—Sept. 12-Sept. 16, 1918 | 550,000 |
| Meuse-Argonne—Aug. 26-Nov. 11, 1918 | 1,200,000 |
| Vittons-Veneto—Oct. 24—Nov. 4, 1918 | 1,200 |

Now you know the inside story of that battle of the three Yanks against a dozen Germans. While they were all of the same squadron and fought the same duel to a victorious finish, each won different awards for their individual deeds.

And the little stocky mechanic? He never had an opportunity to wing aloft to win a silver star for "gallantry in action", or a medal for "gallantry above the call of duty." He fought sticky valves, fouled spark plugs, wheezing brokendown motors and proudly wears the bronze stars.

END.

## Brainstorm

*(Continued from page 24)*

dispense with the uncertain retractable landing gear, we have good thrust and acceleration at any speed, the power plant is completely enclosed, there is no danger of the propeller striking anything, the slip-stream and its difficulties are eliminated, and the lift of the wings is not affected by the slip-stream because the jets can be directed toward any point we wish.

And again, the center of thrust can also be made to coincide exactly with the center of resistance without any awkward moments and upsetting couples to deal with because the location of the jets is a flexible affair that is not dependent upon the location of the engine.

And getting down to the bottom of things, we finally arrive at the caterpillar landing gear. The housing for this landing gear, first of all, is built into the lines of the fuselage so that it adds very little, if any, additional resistance. And best of all, it does away with the uncertainties, vagaries and eccentricities of the retractable type as it exists today. There is just one less control to handle, and just one less chance of a landing accident.

This caterpillar consists simply of two pulleys carrying an inflated belt. As long as the ground touches any part of the belt when landing, everything is jake. It has the certainty of the old time skids and the frictionless properties of the best of modern ball bearing wheels. And, best of all, it is self-contained and does not call for a tail-skid. It will correct the ship itself through a wide range of landing angles without the assistance of power consuming auxiliaries. Two short skids, that foldup into the caterpillar frame afford lateral support when the ship comes to a full stop, but they are never in the wind-stream.

And mind you, all this hooey has emanated from a guy who is the foe of high speed and who believes that racing should be buried alongside the remains of the last dinosaurus. His philosophy at the time ran like this, "if they want speed, give it to 'em in one big chunk".

END.


**CURTISS SUPER HAWK**

**2-FOOT FLYING SCALE MODEL**
**Construction Set**

**$1.00**

24" Wingspread, 1½ oz. Flies 600 feet.

The most sensational value in model sets, including all materials, insignias, glue and full size drawings. Model flies over 1 minute.

**Other Flying Model Sets**

Travelair Mystery 24" Set....$2.50
Gee Bee 12".....$1.10
Boeing 17"x P936 Set.....$1.65
Curtiss Hawk P6E 17".....$1.50
Curtiss Falcon 18" Set.....$1.50

New 1933 Catalogue 10c Coin

**MINIATURE AIRCRAFT CORP.**
83 Low Terrace, New Brighton, N. Y.

# Bill the Go-Getter Gets an Idea——*and did it work?*

BOY LOOK AT THESE CLEVELAND MODELS! I JUST HAVE TO GET SOME OF THOSE FOR CHRISTMAS - BUT I'LL HAVE TO STEP ON IT HERE IT IS WELL ALONG IN DECEMBER - NOW LET ME GIVE THIS A THINK — WOWIE!! I GOT AN IDEA
MAGAZINE AD
1
HELLO MISS BROWN!! WILL YOU PLEASE WRITE FOUR COPIES OF A LETTER FOR ME? BUT DON'T TELL DAD!! I'LL FILL IN THE NAME OF THE PERSON EACH GOES TO - ALSO LEAVE A BLANK SPACE AFTER THE "PLEASE GET ME"
WHY CERTAINLY BILL - I'LL BE GLAD TO
NEXT DAY BILL DROPS IN HIS DAD'S OFFICE
2
I'LL PUT DAD DOWN FOR THE NEW GEE-BEE - AUNT MARY FOR THE DH-4 - UNCLE TOM FOR THE GREAT LAKES SPORT TRAINER AND UNCLE NED FOR THE LAIRD SUPER-SOLUTION
LATER AT HOME
3
THE IDEA WORKED ALRIGHT-ALRIGHT!!
From DAD
From Aunt Mary
From Uncle Tom
From Uncle Ned
CHRISTMAS MORNING
4
Here's the letter Bill wrote —
Dear
I thought if you were wondering what to get me for a present - you might like to know what I really want. Please get me a Cleveland-Designed . It costs only . A lot of the boys I know have these Cleveland-Designed models - and they're certainly the best I've ever seen. If you can't get it at a store in town, just send a check direct to the Cleveland Model & Supply Co. Inc., 1866 West 57th St., Cleveland, Ohio. They'll take care of it immediately.
Thanks very much, and with lots of love
Bill

# Still time for you, too, to get the authentic CLEVELAND-DESIGNED Models you want for Christmas—

## *but you must act QUICK!*

Never has the demand for these increasingly famous Cee-Dee Kits been so great. This Christmas is breaking all records.

**HERE'S WHAT OTHERS SAY**

"Sometime ago I ordered a DH-4 from you. I finished my plane and I mean to tell you that it really flew and I mean it. I measured the distance and the total was 3908 ft. Hard to believe, but true. That's why I am getting another and several other models from you at Xmas."
Port Deposit, Md.

"I must write to tell you that I never got a better, more complete Kit, for twice or three times the amount I paid, than the Kit you recently sent me. It was complete in every way and the finished model looks more like the real plane than any other concerns' models. When I bought other Kits I usually had to buy extra material in order to finish it. By the time I was satisfied with the model I found out that I spent twice the original price of the Kit. But with your Kit I didn't have to buy a single other article such as colored dope, etc. Besides, I had plenty of material left. From now on I'm a Cleveland Model enthusiast."
Brooklyn, N. Y.

"I purchased one of your Fokker D-VII Kits. It completely surpassed all of my expectations. I can truly say you have the best line of models on the market."
Ottawa, Kans.

We anticipated it so we're thoroughly prepared. HOWEVER, tempus is fugiting and in order to avoid disappointment, we suggest you not delay a moment ordering—or having your Dad, or Aunts or Uncles order the Kits you want. Bill's idea was a smart one at that—it brought results! On the right we show a giant coupon listing the complete "Cee-Dee" Line. Use it to benefit yourself most. Either check the Kits you want and hand it to your Mother and Dad for action—or use it yourself. Should you want to see pictures of any of the Kits listed in the coupon, turn to our double spread in the December issue of this magazine—though most boys closely following aeronautics are familiar with the pictures of the big ships themselves, and know Clevelnad-Designed models resemble them enough to be their kid brothers.

If your store dealer can't supply you with the Cee-Dee Kit you want, order direct. Be sure to enclose check, cash or money order (no C. O. D.'s), and your order will be promptly filled and rushed back to you. We're prepared to render SUPER service right up to the last minute to take care of every emergency, but don't tempt the gods and chance disappointment. Decide **NOW** what Kits you want and go to your dealer or order direct without delay. And then when Christmas comes you'll certainly have the **Merry Christmas** that we're trying to make it possible for every model builder to have.

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[ ] **FL-106:** Curtiss Hawk
[ ] **FL-107:** Mystery Ship
[ ] **FL-108:** Boeing Mail
[ ] **FL-109:** Curtiss Robin
[ ] **FL-110:** Vought Corsair
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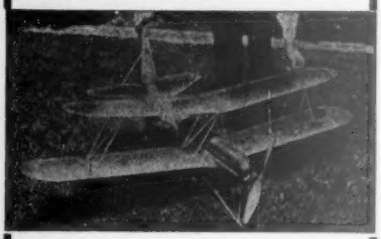

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Power Unit Motor and Container and propeller, ready, $9.90

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## Diesel Engines

*(Continued from page 30)*

tice goes, and seems doomed to remain so. Most far-sighted engineers believe that the aircraft Diesel would prove more rather than less expensive to operate than the gasoline engine.

To be fair, it must be admitted that the fuel oil burned by Diesels *weighs* a little less than gasoline for the same heat value, so that, for dirigibles and long-distance airplane flights, the lower weight of the fuel may off-set the greater weight of the engine to an extent sufficient to justify the use of Diesels for that particular class of work and flying.

The fact that the Diesel does not interfere with radio communication does not seem highly important, since shielding the ignition of a conventional engine is not difficult. The alleged unreliability of the ignition and carburetion systems of the present engines may be less serious than the unreliability of the injection mechanism of the Diesel.

END

## Ford Engines

*(Continued from page 38)*

Another thing that I find will save the belts a lot is to put a ⅛ inch spacer between the magneto and the bracket to make the shelf ⅛ inch lower. If your belt is a little thick, it will not now rub on the magneto shaft.

After you have the magneto shelf and braces all welded on, weld in a piece of ⅝ inch, 13 gauge strip steel between the two braces below the center of magneto. This is shown by the plans and it is very important that you have a strong and rigid magneto bracket. The magneto coupling is also very important, and I know that most of you, who have tried to connect the magneto, have had trouble.

We have also had a lot of trouble along these lines, but if you use a coupling as shown in the drawing, you are sure of success and the coupling is cheap and easy to get. Notice the little bolts that come with the coupling. The stud bolts are about ¾ inch long with one screwed through and riveted on the underside. You can take the magneto cover off only by taking the four hold-down bolts from the magneto base.

We have flown this type of coupling hundreds of times and it stands up very well. I do not advise an adjustable coupling, but time the magneto with the rigid coupling so that it fires at from 28 to 30 degrees before the top center on the compression stroke. You do not need to use the variable spark part of the magneto, but can fasten the magneto breaker box at the fully advanced position.

However, it is easier on your ship if you can retard the magneto when the engine is idling, and this, of course, means that the variable spark has its


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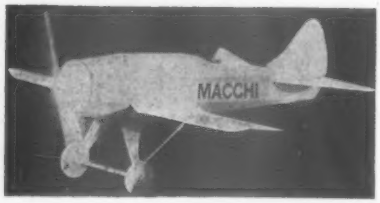
There are only two types of construction used in widely-advertised models—the simple Midland monocoque construction, and the complicated paper - covered frame-work construction.

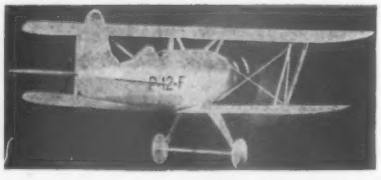
The Midland construction results in a good-looking, easily-built model which can be sold at a reasonable price. The other construction is complicated, hard to build, wrinkled and unsightly if not built by an expert. **And it is too expensive to enable other firms to sell good models at a low price.**

If you are willing to pay two or three dollars for a set you may get one from which you can make a satisfactory model. But don't expect to get much pleasure or satisfaction from a cut-price set of the ordinary complicated construction. Cheap material, poor design, hard - to - understand drawings, and hours of tedious work for you. Many cut-price models are too poorly designed to fly, testimonials and exaggerated flight claims to the contrary notwithstanding.

Midland models are the only low-priced models which are good looking, easily built, and capable of good flights.




MACCHI low-wing pursuit monoplane, first cousin of the seaplane racer said to have made 470 m. p. h. on secret tests at Lake Garda, Italy. Wing span 11 in., weight ⅜ oz. One of the prettiest models ever built, easily constructed, and capable of long, fast flights.

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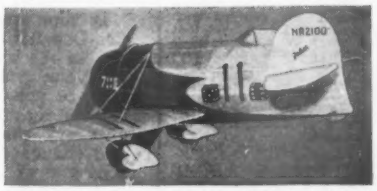


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good points, although it is not absolutely essential.

The next thing in order is to install an oil flying-ring if you wish to avoid having your engine leak oil out of the magneto end. This is made from a piece of an old crankshaft fan pulley, about $\frac{3}{16}$ inch inside, with a small setscrew threaded in. Do not try to hold this by screwing it against the shaft, but drill a small hole in the crankshaft to take the screw; also put a little gasket shellac on the shaft before putting the fly-ring on to stay.

By looking at the plans, you will notice that there is a cup set over this ring to return the oil to the crankcase. This is made out of the grease retainer used on a Model "T" rear axle. I advise you to turn the hole out to 1¼ inch, then braze around the edge and turn it to fit the crankshaft—$1\frac{3}{16}$ inch—so it will not cut the shaft.

After you have done this, joining the plate and oil retaining cup complete, slip it on the crankshaft and drill the holes through the timing gear cover plate so that they will be in exact line. You may now remove the crankcase from the block, and solder or braze the 8-32 machine screw heads on the inside as shown in the drawing.

Next, make up your oil pan exactly as shown on the plans. Do not try to change this unless you know what it is all about. This must be exactly right or else it is all wrong. It never can be halfway right and work.

The principle on which the system works had better be explained briefly. You will notice that the pressure pipes go to the front and center bearings on the engine and that there are ¼ inch pipes run in $\frac{5}{16}$ inch holes.

This is supposed to be this way for it must leak a lot of oil around these pipes to fill the chamber. Be sure that the pipes in the chamber do not rub on any of the valves springs. Drill a small hole through the oil dams and wire or clamp these pipes so that they are held rigidly without any chance to shake loose.

Now, when the engine is cold and it is started the first time, there is a high oil pressure which shoots a good stream of oil to the pipe that runs to the front of the pan through the pipe marked "pressure," and there is practically no oil going through the gravity pipe. After the oil gets hot, the gravity pipe takes a good share of the oil and there is not as much pressure on the other pipe.

When you fly the ship with the nose low, the valve chamber fills with oil, it overflows and the engine is lubricated like the regular car engine. Therefore, do not make these pipes any larger than shown in the drawing.

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EDITOR'S NOTE—*The third and concluding article of this series by B. H. Pietenpol will appear in the February issue of* POPULAR AVIATION. *It will contain further detail drawings of the various altered parts and instructions for installing the engine in the plane after the completion of the engine.*


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## Sky-Flyer

(*Continued from page 43*)

is being wound, the rubber is quickly removed through the top opening of these guides and after being fully wound they are placed back so that they revolve within the center while the propellers are turning.

The thrust-bearing is of medium weight and is made from small strip steel or from one-half of a cotter pin. A hole is drilled at one end, large enough to receive the shaft. This hole should not be too large, but should fit very closely around the shaft diameter. A large hole will allow the propeller to wobble and prevents the model from making a smooth and steady flight.

When the shaft is inserted into the thrust-bearing the distance between the frame and the center of the shaft should be three-sixteenths of an inch. This will allow a minimum clearance space of one-sixteenth of an inch. Refer to the top view of the drawing, which clearly illustrates these important little points. All fittings are attached with cement and thread. A bright color thread, red or green, is best suited. Two washers should be placed between the propeller and the thrust bearing on each shaft. A drop of oil will assist in allowing the propellers to revolve freely.

### NOTES ON RUBBER MOTOR

SIX strands of one-thirty-second by one-eighth inch rubber are required to turn the propellers at a good speed and fly the model for a long distance. To increase the speed, an additional strand may be added. If two additional strands are added, the duration of the model is cut down somewhat, but the climbing ability becomes so great that the model will shoot up in an almost vertical line. A good grade of rubber lubricant will assist considerably by increasing the amount of turns obtainable.

### MAKING THE PROPELLERS

TWO propellers are required, one left-hand and one right-hand. A ten-inch diameter with a pitch of fifteen inches is best suited. The correct size is given in the material list and by following the standard method of carving, no trouble should be experienced in completing the propellers with a pitch which will be close enough to give good flight with considerable duration.

### COVERING THE WINGS

TWO colors of tissue are used for both the main wing and the stabilizer. Red is used on the front side toward the tips on both wings and on the main wing a triangular section of red is used toward the rear center part. Cut the tissue to the approximate correct size, then overlap one-eighth of an inch and cement the red and white pieces together.

After the pieces have been cemented to fit the wing, they are attached with banana oil. Banana oil is used to cement the various colors to one another, as this material does not cause the tissue to shrink as much as dope. It does not distort the tissue and fold over, causing a very rough surface. However, when attaching the tissue to the frame, dope may be used on the wood parts but only on the outer edges.

In this way, the tendency of the outside edges to draw up will cause the tissue to stretch over the entire framework closely. At the inner sections, where the red and white tissues meet, cement a small stripe of black tissue about one-eighth of an inch wide. Use banana oil to attach these small stripes. These black stripes help to offset and make a greater distinction between the colors. The underside of both wings and rear stabilizer is entirely white. It is not necessary to use any other material than plain water sprayed over the wings to cause them to become taut. Do not brush the wings, but use some small type of sprayer, which is readily obtainable in all ten cent stores.

END


STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

OF POPULAR AVIATION, PUBLISHED MONTHLY AT CHICAGO, ILL., FOR OCTOBER, 1932.

State of Illinois } ss.
County of Cook }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared B. Geo. Davis, who, having been duly sworn according to law, deposes and says that he is the Editor of the Popular Aviation and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Aeronautical Publications, Inc., 608 So. Dearborn St.; Editor, B. Geo. Davis, 608 So. Dearborn St.; Managing Editor, J. B. Rathbun, 608 So. Dearborn St.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given). Aeronautical Publications, Inc.: W. B. Ziff Co., 608 So. Dearborn St.; W. B. Ziff, 608 So. Dearborn St.; David Ziff, 608 So. Dearborn St.; B. Geo. Davis, 608 So. Dearborn St.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the two paragraphs contain statements embracing affiant's full knewledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

Sworn to and subscribed before me this 23rd day of September, 1932.

B. G. DAVIS
(Signature of editor, publisher, business manager or owner)

A. T. PULLEN
(My commission expires January 25, 1936.)

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*(Continued from page 22)*

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The rotating wings or blades on one side of the craft would be going forward and those on the other side would be going backward, tending to tip the ship over. In his first machine he therefore followed the precedent of helicopter designers and built two sets of blades, one above the other, designed

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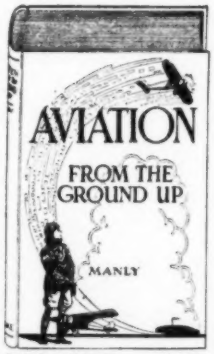


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## Sky-Flyer

(*Continued from page 43*)

is being wound, the rubber is quickly removed through the top opening of these guides and after being fully wound they are placed back so that they revolve within the center while the propellers are turning.

The thrust-bearing is of medium weight and is made from small strip steel or from one-half of a cotter pin. A hole is drilled at one end, large enough to receive the shaft. This hole should not be too large, but should fit very closely around the shaft diameter. A large hole will allow the propeller to wobble and prevents the model from making a smooth and steady flight.

When the shaft is inserted into the thrust-bearing the distance between the frame and the center of the shaft should be three-sixteenths of an inch. This will allow a minimum clearance space of one-sixteenth of an inch. Refer to the top view of the drawing, which clearly illustrates these important little points. All fittings are attached with cement and thread. A bright color thread, red or green, is best suited. Two washers should be placed between the propeller and the thrust bearing on each shaft. A drop of oil will assist in allowing the propellers to revolve freely.

### NOTES ON RUBBER MOTOR

SIX strands of one-thirty-second by one-eighth inch rubber are required to turn the propellers at a good speed and fly the model for a long distance. To increase the speed, an additional strand may be added. If two additional strands are added, the duration of the model is cut down somewhat, but the climbing ability becomes so great that the model will shoot up in an almost vertical line. A good grade of rubber lubricant will assist considerably by increasing the amount of turns obtainable.

### MAKING THE PROPELLERS

TWO propellers are required, one left-hand and one right-hand. A ten-inch diameter with a pitch of fifteen inches is best suited. The correct size is given in the material list and by following the standard method of carving, no trouble should be experienced in completing the propellers with a pitch which will be close enough to give good flight with considerable duration.

### COVERING THE WINGS

TWO colors of tissue are used for both the main wing and the stabilizer. Red is used on the front side toward the tips on both wings and on the main wing a triangular section of red is used toward the rear center part. Cut the tissue to the approximate correct size, then overlap one-eighth of an inch and cement the red and white pieces together.

After the pieces have been cemented to fit the wing, they are attached with banana oil. Banana oil is used to cement the various colors to one another, as this material does not cause the tissue to shrink as much as dope. It does not distort the tissue and fold over, causing a very rough surface. However, when attaching the tissue to the frame, dope may be used on the wood parts but only on the outer edges.

In this way, the tendency of the outside edges to draw up will cause the tissue to stretch over the entire framework closely. At the inner sections, where the red and white tissues meet, cement a small stripe of black tissue about one-eighth of an inch wide. Use banana oil to attach these small stripes. These black stripes help to offset and make a greater distinction between the colors. The underside of both wings and rear stabilizer is entirely white. It is not necessary to use any other material than plain water sprayed over the wings to cause them to become taut. Do not brush the wings, but use some small type of sprayer, which is readily obtainable in all ten cent stores.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

OF POPULAR AVIATION, PUBLISHED MONTHLY AT CHICAGO, ILL., FOR OCTOBER, 1932.

State of Illinois } ss.
County of Cook }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared B. Geo. Davis, who, having been duly sworn according to law, deposes and says that he is the Editor of the Popular Aviation and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Aeronautical Publications, Inc., 608 So. Dearborn St.; Editor, B. Geo. Davis, 608 So. Dearborn St.; Managing Editor, J. B. Rathbun, 608 So. Dearborn St.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given). Aeronautical Publications, Inc.: W. B. Ziff Co., 608 So. Dearborn St.; W. B. Ziff, 608 So. Dearborn St.; David Ziff, 608 So. Dearborn St.; B. Geo. Davis, 608 So. Dearborn St.

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(Signature of editor, publisher, business manager or owner)

A. T. PULLEN
(My commission expires January 25, 1936.)

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*(Continued from page 22)*

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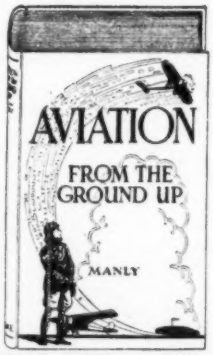


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to be rotated by the wind in opposite directions at the same time.

This first crude craft was composed of a very old Deperdussin fuselage, with its wings clipped, an ordinary screw propeller driven by a Gnome engine, the two sets of windmill wings and a vertical fin over them for the important lateral control.

As soon as the queer craft was finished, he hastened to try it out. The engine roared, the propeller drew the machine forward, the windmill wings turned most satisfactorily. But only one wheel lifted from the ground. The craft tilted dangerously to one side. Not wishing to do a barrel roll, he shut off the engine.

A little investigation convinced him that the downward flow of air from the upper rotor or set of blades had interfered with the free rotation of the lower rotor.

THE first machine had failed. But he had learned that wind-driven blades did exert a lifting power. With that patience which is acquired only after one has known and surmounted a drastic defeat, he set about the designing of a second machine with only one rotor of three rigidly revolving wings instead of his former design.

The foundation of this machine was a Hanriot fuselage with a fairly powerful motor. In it he utilized an idea of the helicopter designers for changing the wings as they revolved, to overcome the tipping effect. This complicated the machine somewhat and made it necessary to reset a cam action at every change of speed. This craft also rushed forward bravely, raised one wheel in the air and tipped over on its side, refusing to fly.

Undaunted, he built a third type of machine, which had five rotor blades and a system of ailerons to counterbalance the tipping effect. When he tried it, it hopped into the air, stayed there just a minute or two, but enough to cheer the now patient Juan.

He tried it again and again in great enthusiasm. It continued to hop into the air but it would not fly. At times it also tipped over on its side. At last he was compelled to admit that it too was a failure. Some basically important feature was still needed.

Still not willing to admit defeat, he continued to work long hours on the problem. He built a number of toy models. One had four rattan blades and a screw propeller, rotated by rubber bands. It flew extremely well, at the end of each flight drifting slowly to the ground with revolving blades.

De la Cierva was astounded. Here was exactly the result for which he had been striving. He excitedly examined the little model. It was designed exactly like the large craft which refused to fly. Why did it fly and the other tip over on its side? He racked his brain for an answer to the question.

The solution came suddenly as so many solutions come, from the sub-conscious mind. He was at an opera in Madrid with his wife, apparently listening attentively to the singing. In one moment he was lifted from tragedy to the heights of enthusiasm. "I have it!" he exclaimed.

"Have what?" his wife demanded.

"My little model—you know? The blades are made of very thin rattan. That allows them to flex automatically —*entiendes?*"

She looked at him in wonder. Would she ever understand this inventive husband of hers? Here he was, excited over a mechanical matter in the middle of an opera! He did not hear the remainder of the performance. Even the loudest song-talk did not disturb his mechanical speculations.

The rattan model flew because its rotor was flexible. When a blade was moving forward, thus tending to create a greater lift than the opposite retreating blade, its flexibility permitted it to rise a trifle and correct its tendency to unbalance the craft!

This rise of the flexible wings was enforced by the gyroscopic action of the rotor as a whole. In a full-scale model the wings could not be made flexible but they could be hinged to the mast, so as to be free to rise. Would hinged, freely rotating blades lift the machine safely and surely?

HE INVESTIGATED the new theory further and then embodied it in a fourth type of autogiro. The rotor was crude with fifteen foot blades, built like narrow airplane wings and hinged to the central mast. It was constructed to be tilted from the cockpit for steering. When completed, the machine was run on the ground and apparently had no tendency to tip over. De la Cierva was overjoyed.

On January 9, 1923, it was taken to the Getafe Airdrome in Madrid and


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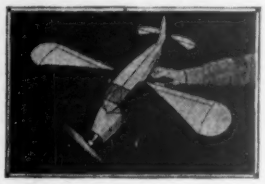

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a Spanish Cavalry officer attached to the air service, was the test pilot.

Thus, after the lapse of some five years, Juan de la Cierva, a warrior of civilization well seasoned by defeat, again stood on a testing field, anxiously watching an army flyer take up a craft of his own creation.

The engine roared into life. The Spaniard with an English name was warming it. Now the crude craft was moving forward. Now the wheels lifted into the air. It flew!

At the other end of the field, Lieutenant Spencer brought it down to a safe landing. The first flying machine with rotating wings had flown!

As Juan de la Cierva watched it land, he could see in his mind's-eye the world of the future. Flat-topped office buildings with autogiros taking off and descending like birds on a cliff—country homes where families boarded air machines for swift flights into the city — air-lines thick with rotating wings—autogiro wings—his wings!

HE DID not know that before any heavier-than-air craft had ever flown, Orville Wright had conceived the idea of achieving lateral stability of an airplane by *hinging the wings to the fuselage.*

He did not know that in 1909 Louis Breguet had patented in France a helicopter with rotating blades that were *hinged to the fuselage.* The main difference between his machine and Breguet's helicopter lay in the fact that his wings were rotated by the wind of flight, whereas Breguet's hinged rotor was power-driven.

This disconnecting of the rotor from the engine seems to be a very slight improvement, until we take into consideration the fact that de la Cierva's machine actually flew, while all other rotating-wing craft had failed. Merely by allowing the wind to rotate the hinged blades freely he had solved the seemingly insurmountable problem.

We should not forget the host of other pioneers, of the internal combustion engine, the airplane and the helicopter, whose work formed the ladder up which de la Cierva mounted to success. De la Cierva added one important improvement to the sum total of their efforts and thus made the autogiro. He was inventor—an inventor of the first magnitude—but he alone did not create that crude machine that flew at Getafe Airdrome. He added the supreme refinement.

But let us not detract from the pleasure of his hard-earned moment of victory, as he stood there in the bright sunshine of Old Spain and rejoiced at the performance of his wings. Let us rejoice with him.

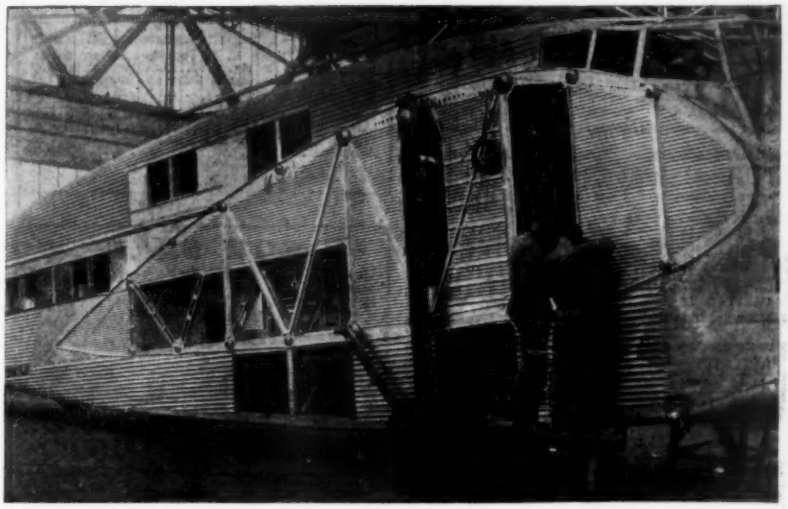
And if this aticle serves no other purpose, it will prove an inspiration to those inventors and experimenters who have failed with their projects, to ignore failure and try-try-again. Admittedly this takes courage but it is the royal road to success.

END.


# The Giant Junkers

## A European Sensation

## Just One Feature of the February P. A.



Body of Junkers ship under construction. This plane is shown in flight on the cover of the February issue—in colors.

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**Official Flying Scale Models**
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(Continued on next page)

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These SPEED BOAT PLANS, POSTPAID.....25c
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ALL PARTS FORMED AND CUT READY
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| 1/8x1/4 | 15 for .8c | 1/8x1 | .7c | 1/8x2 | .7c |
| 1/8x1/4 | 14 for .8c | 1x1 | 10c | "Prop. Blocks" 3/8x1x8 | .2c |

Add 15c for Packing and Postage. Send for Price List.
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**A Real 1/8 h.p. Gasoline Engine**
in miniature, for MODEL AIRPLANES and boats. ¾ in. Bore ¾ in. Stroke—weight 1 lb.—3200 R.P.M. GET CATALOGUE, REAL BOATS, MOTORS—FITTINGS, ETC.—only 20c (coin). LOUIS P. LOUTREL,
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Write for wholesale prices

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### A NEW TRANSMISSION

This new GEARLESS device doubles the endurance and increases the performance of flying models. Two separate strands of rubber run the same propeller. It may be glued to motor stick or fuselage. Directions included.

The whole transmission weighs only 1/40 ounce but will fly models up to 1½ ounces in weight. Retail price, 40c postpaid. Post card brings circular of this and other types of transmissions. Dealers write for discounts.

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**NATIONAL "MIDGET" ELECTRIC MOTOR 1.25 Postpaid**
**Construction Kit**

Complete with detailed blueprint, brass bearings, laminated electrical silicon steel field and armature, spring brushes, wire, shafts, screws, all ready to assemble . . . for model trains, boats, etc. Easy to build.

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MADE SPECIALLY FOR MODEL PLANES — Used by Thousands!

Finishes Balsa like Metal Surface—Paper Looks like real Fabric.

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**BOYS!** Build 2 Wartime Planes for the price of one. Our Supply Kit contains more than enough Balsa Sheets, Sticks, Cement, Plans, etc., to build 2—15 in. Wartime or Modern Planes sent postpaid, only $1.00. Perfect cut "Navy Specified" Smooth Balsa 36 in. long, 1-16 in. sq. 7 for $0.05. 1-8 in. sq. 5 for $0.05. 1-32 in. x 2 in. each $0.05. 1-16 x 2 in. each $0.06. Jap Tissue $0.04 Sheet. Clear Dope per oz. $0.08. Send stamp for price list and samples.

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## MISCELLANEOUS

### GLIDER PLANS

**THE GLIDER PLAN BOOK,** containing blue prints, authentic specifications and performance factors for **Ten Famous Soarers....45c**
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**Booklet of 300 typical exam questions with correct answers, includes 1932 changes in Rules and Regulations, Aerodynamics, Engines, Ignition, Navigation and Meteorology Covers all grades Pilots and Mechanics written exams. Send one dollar today. Booklet of Safety Flying Rules. 115 Don'ts, with reasons on twenty primary flight maneuvers. Price 50c.**

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GOOD BOOKS—Stamp brings circulars. Goldenrod, Dept. 200, Harrisburg, Ill.

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PLASTEX INDUSTRIES offer industrious men an opportunity to start a business of their own, manufacturing art goods, novelties, souvenirs, etc. in Plastex and marble imitation, 5c material makes $1 articles. Rubber moulds furnished for speed production. Small investment brings big returns. Big X-mas business starts this month. You are just in time. Write for interesting booklet mailed free. Plastex Industries, Dept. G, 1085 Washington Avenue, New York.

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MOTION PICTURE Bargains. News reels $2.25, odd reels $1.50. Bargain lists. Hoffman Film Service, 57 Broad, Albany, N. Y.

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PATENT Your Invention—"Little Ideas May Have Big Commercial Possibilities." Send for free book, "How to Obtain a Patent" and Record of Invention Blank. Prompt service. Highest references. Reasonable charges. Deferred payments. Established 1898. Victor J. Evans & Co., 790 Victor Building, Washington, D. C.

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U. S. PACKET, 55 diff., many commemoratives, 20c. Copley Stamp Co., Copley, Ohio.

## Aero-Sportswomen

(*Continued from page* 28)

up her records. Up to this time, the F. A. I. has issued no official report.

* * *

Do women fly lightplanes. O, Yes. Mrs. May Haizlip flew the celebrated "Ike" at mighty near its record speed, while Edna Whitcombe, an English aviatrix, recently put up a lightplane record of 131 m p. h. with a 36 h. p. English Lightplane.

* * *

Gertrude Hofer, Berlin, Germany, recently toured Germany in a tailless monoplane, much to the amazement of the rather domineering male pilots. We understand that she made this trip in a Heinkel which is one of the foremost German sporting type planes.

* * *

We often see photos of women taking mechanic's courses in aviation schools and then lose track of them. Do they ever follow this trade after they graduate? We are still waiting to hear from some active women airplane mechanics, really at work. A number of mechanic's licnses have been granted, but are they in use?

* * *

Women are becoming confirmed airline patrons according to reports received from several of the large airlines. Many actresses find this speedy method of transportation to fill their needs while many women buyers from the large department stores are also steady patrons of the airlines.

* * *

Miss Francis Scott, recently flew solo, the long trek between Miami, Fla., and Santa Barbara, Calif. She averaged, according to her account a speed of 154 m. p h. over the entire distance.

* * *

And don't think for one minute that aviation is a recent fad among women. The Early Birds roster includes many women's names, and to be an "Early Bird" one must have flown before 1914! Among these early women flyers were Ruth Law, Margaret Stinson, Katherine Stinson, Mathilda Moisant, Blanche Scott and many other bird women who took to the air before the World War.

END.

## Royal Mounted

(*Continued from page* 17)

more and there is always the possibility of an early freeze-up when these trips are taken during the short summer. Now the same inspection trips, which used to take many months are accomplished in a few weeks.

And these instances of the use of the airplane by the Royal Mounted Police may in future become commonplace when the use of the flying machine increases as a means of travel. But if this will take many years under ordinary progress, it is expected that the famous force will use planes to a large extent sooner than in the usual run of things. The head of the force at present is an enthusiastic pilot, a man in his fifties.

Major-General J. H. MacBrien, appointed to the command of the Mounted Police in 1931, is an outstanding Canadian amateur pilot who organized the twenty-three government sponsored flying clubs and is at the head of the Aviation League of Canada. The former chief-of-staff for the Dominion, he went into aviation when it became popular, and served for some time as general manager of one of the largest commercial operating companies.

He knows the value of planes and his men are finding out the value of quick travelling by planes placed at their disposal through the headquarters of the force. Officers of the Mounted Police operate all modern means of travel as part of the requirements for their service in certain sections of the country. Pilot licenses may soon form a possible requirement of the future member of the force.

END

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